The PHOTOFACT Servicer

SET 432 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ FEB 15, 1959

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This Servicer provides you with essential data on other models or special equipment not covered in standard PHOTOFACT folders. The schematics and supplementary data included here will be of valuable help to you in servicing this equipment.

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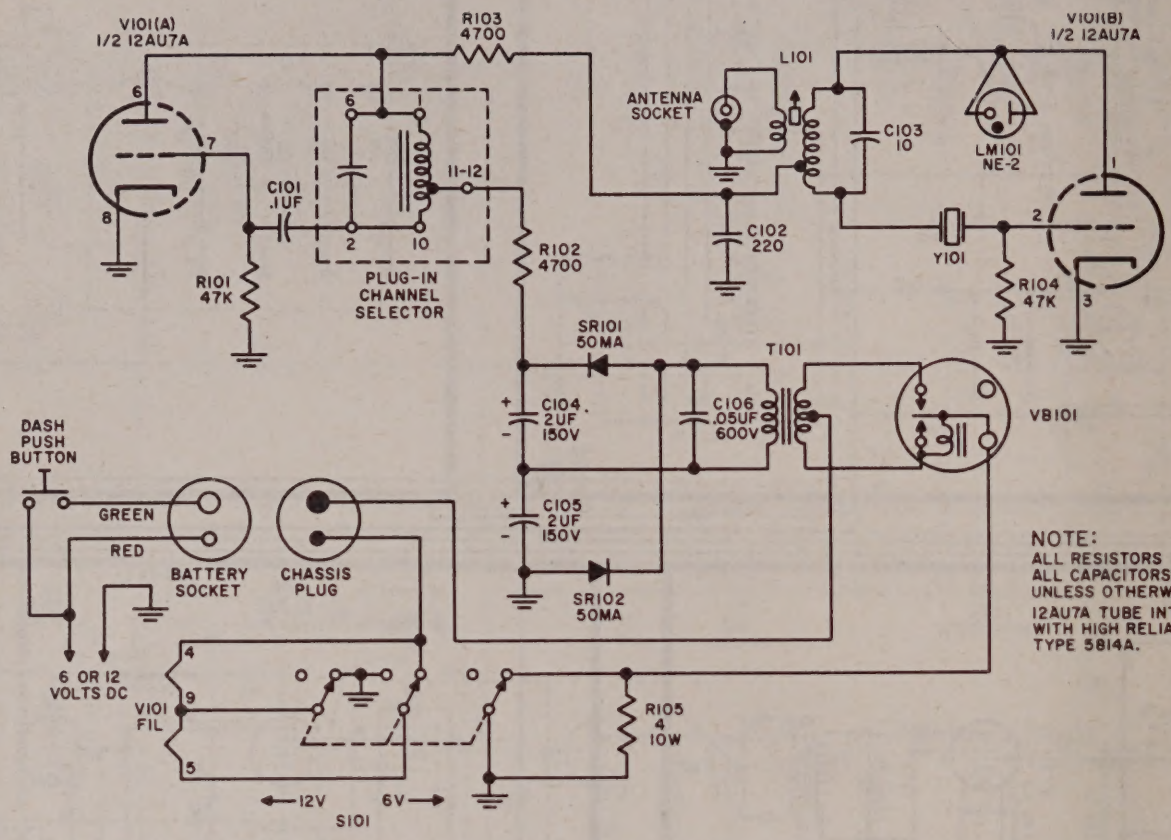
PERMA-POWER
G500
GARAGE DOOR OPERATOR



MODEL RC-200 Transmitter

CIRCUIT SYMBOL	PART	PART NUMBER
R101, R104	47,000 OHM ±20% 1/2 WATT	
R102, R103	4700 OHM ±20% 1/2 WATT	
R105	4.0 OHM ±10% 10 WATT WIRE WOUND	
C101	0.1 MFD ±20% 400 WV MYLAR	
C102	220 MMF ±20% GP CERAMIC DISC	
C103	10 MMF ±10% 500 WV MICA	
C104, C105	2.0 MFD/150 WV ELECTROLYTIC	30A5
C106	.05 MFD ±20% 600V PAPER	
L101	TANK COIL ASSEMBLY	1A18
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S101	4 POLE DOUBLE THROW SLIDE SWITCH	180A3
SR101, SR102	SELENIUM RECTIFIER 130V AC 50MA DC	159A1
VB101	VIBRATOR, 4 PRONG NON-SYNCHRONOUS	211A1

Replacement parts list

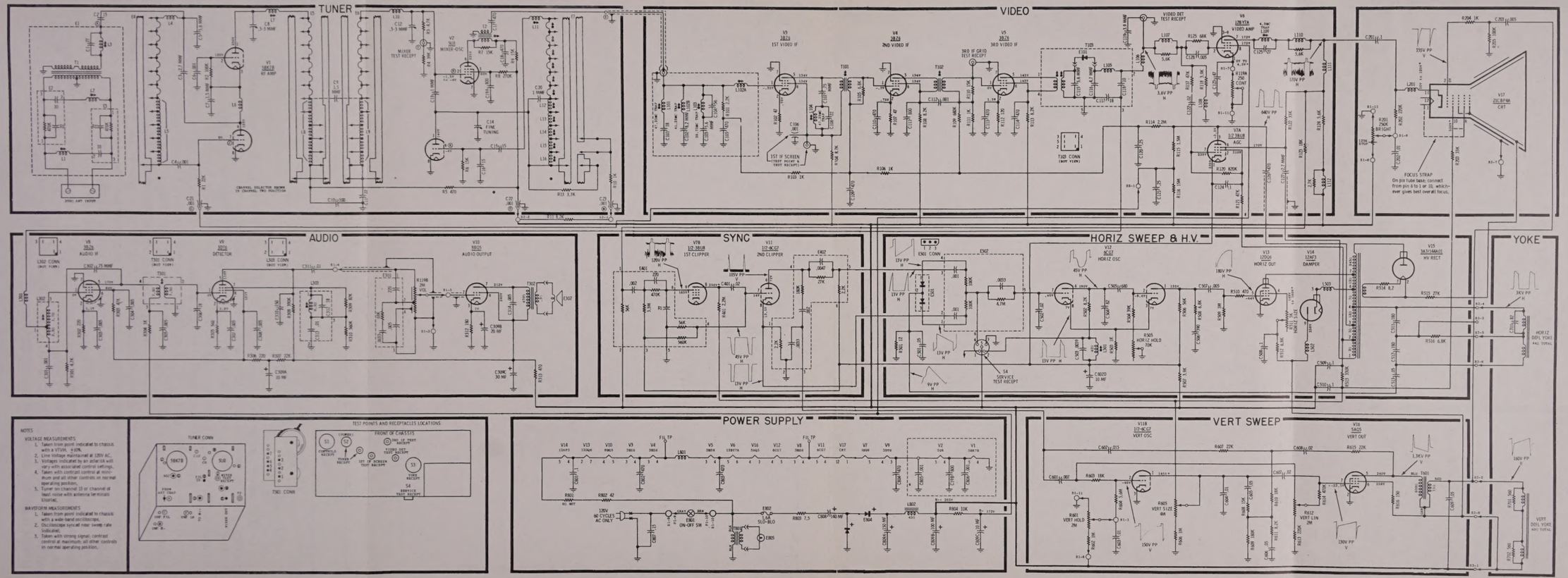
Schematic Diagrams Courtesy of Perma-Power Co.

CIRCUIT DESCRIPTION - RECEIVER

The G-500 Receiver operates on a tone modulated signal received from its companion transmitter. The received signal is amplified in the tuned input circuit L201 and RF amplifier V201. The RF amplifier output, tuned by L202, is detected by the Germanium Diode CR201. Potentiometer R205 functions as a distance control. The AF signal is fed back to the grid of V201 which also functions as the first AF amplifier stage. The output is taken from the screen, which acts as a triode plate for AF amplification. V202(A) is the second AF amplifier. It is resistance coupled to the third AF stage, V202(B). This stage is transformer coupled by T202 to the balanced audio detector consisting of diodes CR202 and CR203 and their respective load resistors R211 and R212. If the audio signal frequency is different from the desired channel frequency, the signal voltages delivered to each diode are approximately equal. The diodes are connected so the DC output voltages are in series but of opposite polarity. Thus, all frequencies other than the channel frequency will cause a net DC output that is zero. However, when the audio signal is at the channel frequency, voltage is blocked from diode CR203 by the filter action of the channel selector network and no DC output appears across R212. The resulting DC output is then positive and causes the thyratron V203 to fire, closing relay K201. V203 is normally kept non-conducting by AC bias applied to its cathode. Capacitor C214 delays operation of the relay for approximately one-half second to prevent transient voltages from causing operation.

MODEL G-500 Receiver

Courtesy of PERMA-POWER Co.


TUNER
VIDEO
AUDIO
SYNC
HORIZ SWEEP & H.V.
YOKE
POWER SUPPLY
VERT SWEEP
NOTES
VOLTAGE MEASUREMENTS
1. Taken from point indicated to chassis with a VTVM, ±10%.
2. Line Voltage maintained at 120V AC.
3. Voltages indicated by an asterisk will vary with associated control settings.
4. Taken with contrast control at minimum and all other controls in normal operating position.
5. Tuner on channel 13 or channel of least noise with antenna terminals shorted.
WAVEFORM MEASUREMENTS
1. Taken from point indicated to chassis with a wide-band oscilloscope.
2. Oscilloscope synced rotor sweep rate indicated.
3. Taken with strong signal, contrast control at maximum, all other controls in normal operating position.
TUNER CONN
TEST POINTS AND RECEPTACLES LOCATIONS
FRONT OF CHASSIS
REAR OF CHASSIS
T501 CONN

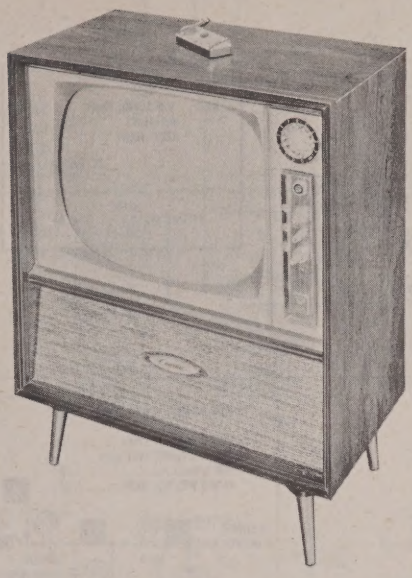
Schematic Diagram Courtesy of MOTOROLA INC.

MOTOROLA MODELS
A21K106B, M,
A21T60BG, CH, MG,
Y21K107B, M,
21K107B, M
(Ch. TS-553, Y, WTS-553)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 6 push-on type knobs from the front.
2. Remove Remote Control unit from the rear.
3. Remove 10 wood screws holding rear cover. Remove the rear cover.
4. Remove speaker leads.
5. Remove 2 hex nuts holding picture tube bracket at the top.
6. Remove 2 metal screws holding chassis support bracket at the top left side.
7. Remove 5 bottom chassis bolts.
8. Remove chassis.



MODEL 21C2550 (U3 Line)

TRADE NAME	General Electric	MODELS
		21C2535, 21C2536, 21C2550, 21C2551, 21C2560, 21C2561, 21L2555, 21L2556, 21L2557 & UHF (U3 Line)
MANUFACTURER	General Electric Co., Appliance & Television Receiver Div., Louisville, Ky.	
TUBES	VHF-Seventeen, UHF-Eighteen	
POWER SUPPLY	110-125 Volts AC, 60 Cycle	RATING TV: 210 Watts, 1.9 Amp. @ 117 Volts AC While Tuning: 240 Watts, 2.3 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)	

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

For touch-up adjustment of the VHF Oscillator, it is necessary to remove the chassis from the cabinet. (See disassembly instructions.)

SAFETY GLASS REMOVAL

Remove 4 metal screws holding metal trim at bottom of the safety glass. Pull safety glass out at the bottom and remove.

SPECIAL ADJUSTMENTS

A. AGC
The AGC can be varied by means of a Local-Distant switch. Additional attenuation can be achieved by cutting the jumper wire connected across a 2.2meg resistor (R40).

B. Focus
The focus may be varied in steps by the position of a plug in the Focus Adjustment board.

C. Width
The width may be varied by means of Width switch. (For location, see tube placement chart.)

HORIZONTAL OSCILLATOR FIELD ADJUSTMENTS

For adjustment of the Horizontal Multivibrator, it is necessary to remove the rear cover and supply power to set. Set the Horizontal Hold at the center of its range and adjust the Horizontal Frequency slug (B1) until the picture synchronizes horizontally. (For location, see tube placement chart.)

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate intercarrier buzz, adjust the Ratio Detector secondary (A11) located on top of chassis.

FUSE

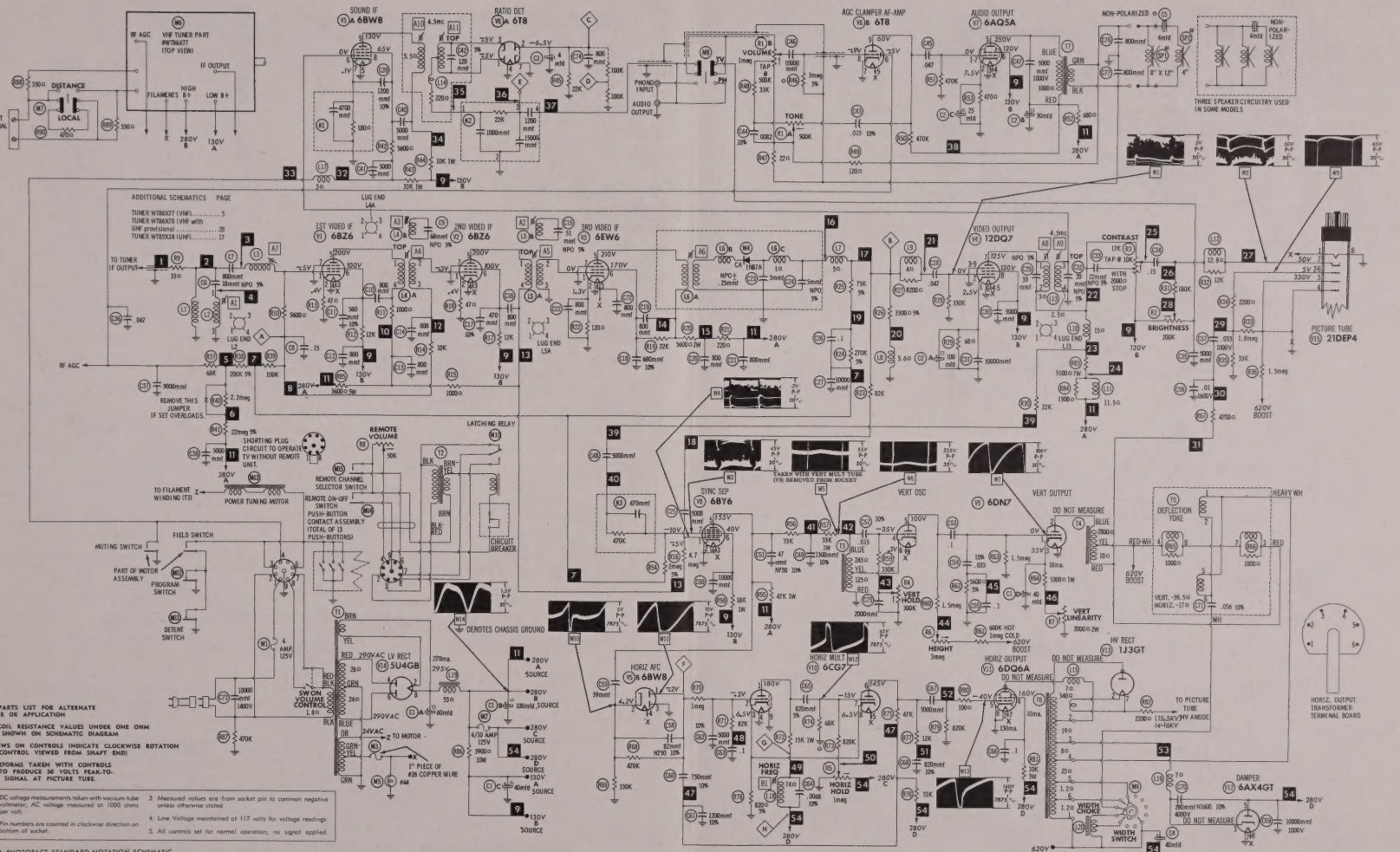
Two fuses and a fuse wire are used for low voltage power supply, horizontal sweep and filament protection.

CENTERING

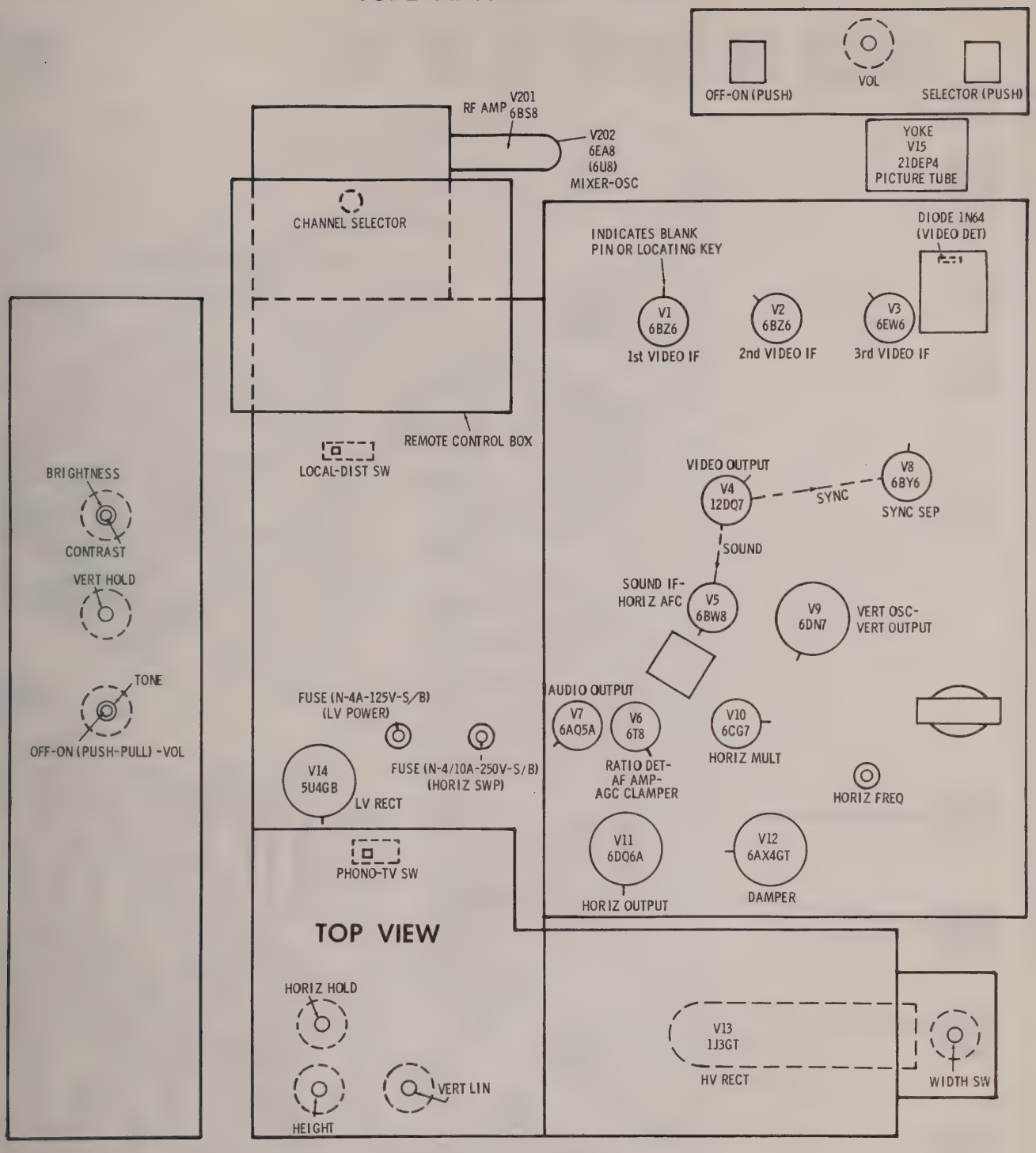
Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of J21 the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America


SOUND IF V3 A 6BW8
RATIO DET V6 A 6T8
AGC CLAMPER AF-AMP V6 B 6T8
AUDIO OUTPUT V7 6AQ5A
VOLUME
TONE
DISTANCE
LOCAL
VHF TUNER PART #WTB6X27 (TOP VIEW)
IF OUTPUT
FILAMENTS
HIGH B+
LOW B+
VHF ANT. TERMINAL BOARD
NON-POLARIZED
THREE SPEAKER CIRCUITRY USED IN SOME MODELS
ADDITIONAL SCHEMATICS PAGE
TUNER WTB6X27 (VHF)..... 5
TUNER WTB6X78 (VHF with UHF provisions)..... 20
TUNER WTB5X24 (UHF)..... 17
1ST VIDEO IF V1 6BZ6
2ND VIDEO IF V2 6BZ6
3RD VIDEO IF V6 6EW6
VIDEO OUTPUT V4 12DQ7
CONTRAST
BRIGHTNESS
PICTURE TUBE V15 21DEP4
TO TUNER IF OUTPUT
RF AGC
LUG END L4A
LUG END L5A
LUG END L3
REMOVE THIS JUMPER IF SET OVERLOADS.
SHORTING PLUG CIRCUIT TO OPERATE TV WITHOUT REMOTE UNIT.
REMOTE VOLUME
REMOTE CHANNEL SELECTOR SWITCH
REMOTE ON-OFF SWITCH PUSH-BUTTON CONTACT ASSEMBLY (TOTAL OF 13 PUSH-BUTTONS)
TO FILAMENT WINDING (T7)
POWER TUNING MOTOR
LATCHING RELAY
CIRCUIT BREAKER
MUTING SWITCH
FIELD SWITCH
PART OF MOTOR ASSEMBLY
PROGRAM SWITCH
DETENT SWITCH
SW ON VOLUME CONTROL
TAKEN WITH VERT MULT TUBE (V9) REMOVED FROM SOCKET
SYNC SEP 6BY6
VERT OSC
VERT OUTPUT V8 6DN7
DEFLECTION YOKE
VERT. -90, 50 HORIZ. -170
VERT LINEARITY
HEIGHT
HV RECT 1J3GT
HORIZ. OUTPUT TRANSFORMER TERMINAL BOARD
HORIZ AFC V5 B 6BW8
HORIZ MULT V10 6CG7
HORIZ OUTPUT V13 6DQ6A
HORIZ FREQ
HORIZ HOLD
WIDTH CHOKE
WIDTH SWITCH
TO PICTURE TUBE (15.5KV) HV ANODE
DAMPER V16 6AX4GT
LV RECT V14 5U4GB
TO MOTOR
1" PIECE OF #26 COPPER WIRE
DENOTES CHASSIS GROUND
280V A SOURCE
280V B SOURCE
280V C SOURCE
130V B SOURCE
280V D SOURCE
620V BOOST SOURCE
DO NOT MEASURE
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)
WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE.
1. DC voltage measurements taken with vacuum tube voltmeter, AC voltage measured at 1000 ohms per volt.
2. Pin numbers are counted in clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line Voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation, no signal applied.
A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE
©Howard W. Sams & Co., Inc. 1959
GENERAL ELECTRIC MODELS 21C2535, 36, 50, 51, 60, 61, 21L2555, 56, 57 & UHF (U3 Line)

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound Fuse (4A), Fusible Wire (F1), V14

SWEEP FAILURE
No raster, has sound V5, V10, V11, Fuse (4/10A), V12, V13, V15
No vertical deflection V9
Poor vert. linearity or foldover V9
Poor horiz. linearity or foldover V10, V11, V12
Narrow picture V10, V11, V12, V14
Vert. off freq. V9
Horiz. off freq. V10

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, V3, Diode (Video Det.), V4
No pic, no sound, has snow V201, V202, V1
No pic, has sound, has raster V4, V15
Has pic, no sound V5, V6, V7
Overloaded picture V6

SYNC FAILURE
No vert. sync V8, V9
No horiz. sync V8, V5
No vert. or horiz. sync V8

GENERAL ELECTRIC MODELS 21C2535, 36, 50, 51,
60, 61, 21L2555, 56, 57 & UHF (U3 Line)
PRINTED BOARD
ARROWS INDICATING TUBE LOCATIONS ARE
POINTING TO PIN 1 UNLESS OTHERWISE INDICATED
A Howard W. Sams CIRCUITRACE® Photo
FOLDER 1
PIN 2
PIN 5
PIN 9
PIN 2
PIN8
E
R85
R86
V1
V2
V3
V4
V5
V6
V7
V8
V9
V10
V11
V12

GENERAL ELECTRIC MODELS 21C2535, 36, 50, 51, 60, 61, 21L2555, 56, 57 & UHF (U3 Line)

VHF TUNER WT86X77

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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TUNER ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

The high voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested alignment tools:

A201 thru A212	General Cement #5097, 8727 Walsco #2515
A213, A214, A215, A216	General Cement #8607, 9291 Walsco #2520, 2522, 2523, 2524, 2537
A217, A218	General Cement #5000, 5003, 8276, 8290 Walsco #2512, 2525

VHF OSCILLATOR ALIGNMENT

Connect variable bias to IF AGC line. Adjust bias to obtain response curve which shows no indication of overloading.
Set Contrast two-thirds from full counterclockwise rotation.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.

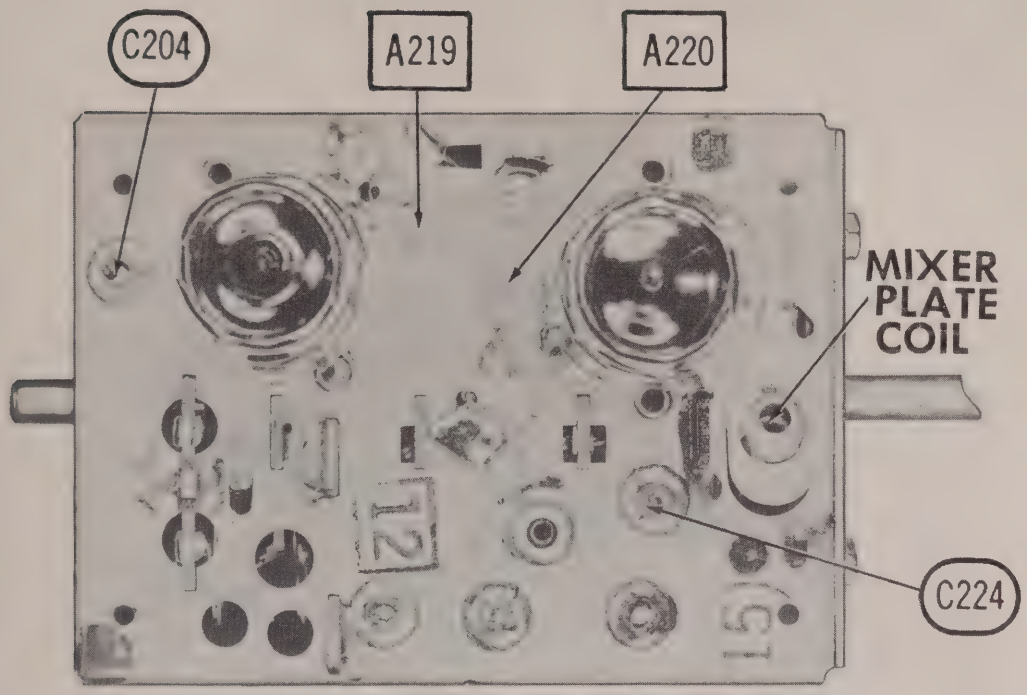
	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Fig. 201	Across antenna terminals thru matching network (Fig. 201).	213MC	211.25MC	13	Vert. Amp. thru 47K across Video Det. load.	A201	Adjust to place video marker at 45% as in Fig. 202.
			207MC	205.25MC	12		A202	
			201MC	199.25MC	11		A203	
			195MC	193.25MC	10		A204	
			189MC	187.25MC	9		A205	
			183MC	181.25MC	8		A206	
			177MC	175.25MC	7		A207	
			85MC	83.25MC	6		A208	
			79MC	77.25MC	5		A209	
			69MC	67.25MC	4		A210	
			63MC	61.25MC	3		A211	
			57MC	55.25MC	2		A212	

VHF RF AND MIXER ALIGNMENT

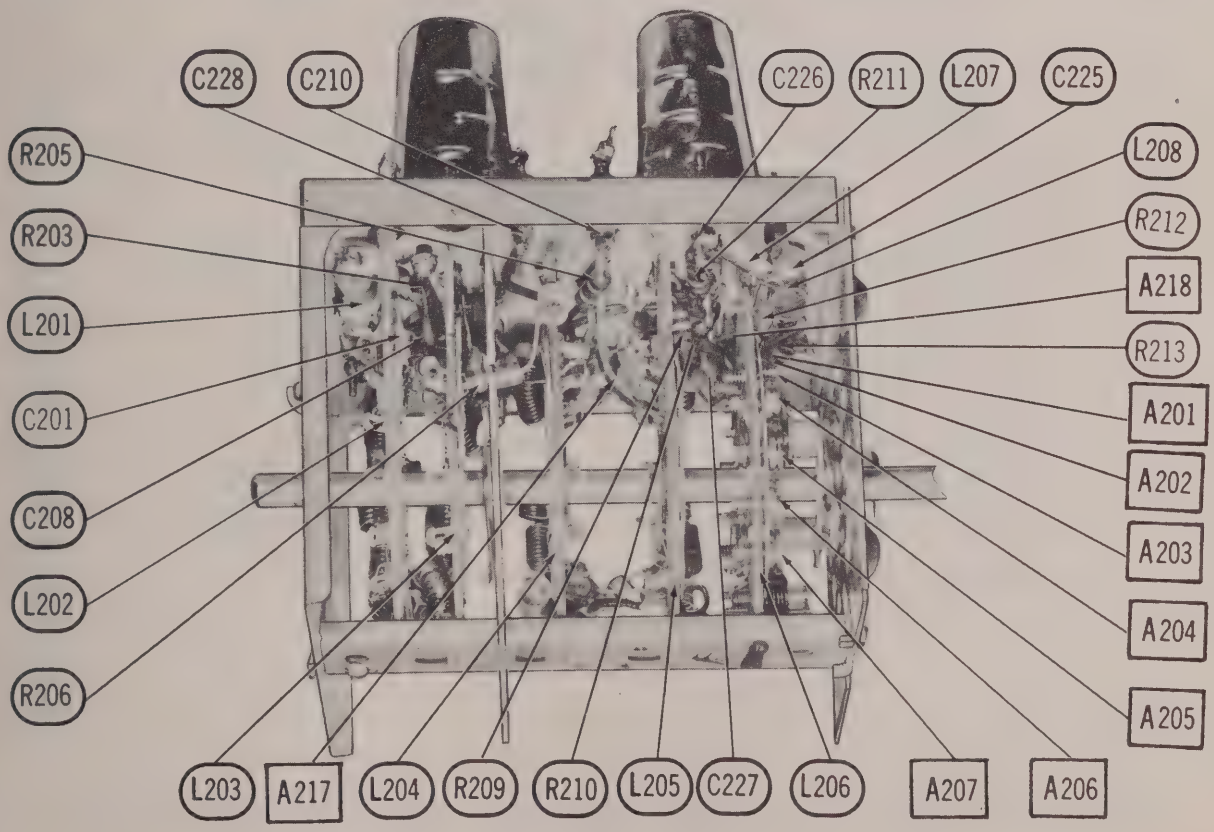
Connect the negative lead of a 3 volt bias supply to point ⓨ . Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
2.	Fig. 201	Across antenna terminals thru matching network (Fig. 201).	213MC	211.25MC 215.75MC	13	Vert. Amp. thru 10K to point ⓤ . Low side to chassis.	A213, A214, A215, A216, A217, A218	Adjust for maximum gain and symmetry of response similar to Fig. 203 with markers as shown. A217 adjusts bandwidth, A218 controls tilt.
3.	"	"	177MC	175.25MC 179.75MC	7	"	A219, A220	Adjust for maximum gain and symmetry of response similar to Fig. 203 with markers as shown. Retouch A213 for maximum gain and equal peaks.
4.	"	"	207MC	205.25MC 209.75MC	12	"		Make compromise adjustments of A213 thru A217 and/or A219 and A220, if necessary. Replace tuner shield when checking response.
			201MC	199.25MC 203.75MC	11			
			195MC	193.25MC 197.75MC	10			
			189MC	187.25MC 191.75MC	9			
			183MC	181.25MC 185.75MC	8			
5.	"	"	85MC	83.25MC 87.75MC	6	"	A221, A222, A223, A224	Adjust for maximum gain and symmetry of response similar to Fig. 204 with markers as shown. Adjust bandwidth by positioning "Gimmick".
6.	"	"	79MC	77.25MC 81.75MC	5	"	A225, A226, A227, A228	Adjust for maximum gain and symmetry of response similar to Fig. 204. with markers as shown.
7.	"	"	69MC	67.25MC 71.75MC	4	"	A229, A230, A231, A232	"
8.	"	"	63MC	61.25MC 65.75MC	3	"	A233, A234, A235, A236	"
9.	"	"	57MC	55.25MC 59.75MC	2	"	A237, A238, A239, A240	"

continued PAGE 19



TUNER WT86X77 - TOP VIEW



TUNER WT86X77 - LEFT SIDE

TUNER PARTS LIST AND DESCRIPTIONS

WT 86X77

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	6BS8	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6EA8	6U8 *

* Alternate.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	G. E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	7.5		WT18X400					5TCCB-V75S ±.25mmf *	NPO ±.25mmf
C202	1.2		WT21X22					5TCCB-V12S 5%*	5%
C203	33		WT18X293		TCL-33				N1500 5%
C204	1000		WT23X8	EF-001	MFT-1000			503C-D1	
C205	1.8		WT21X16					5TCCB-V18S 5%*	5%
C206	1.8		WT21X16					5TCCB-V18S 5%*	5%
C207	12		WT18X284			C10Q12U	CN7-412	5TCU-Q12S 5%*	N750 5%
C208	330		WT18X328	DI-330	DD-331	L10T33	JL-333	5GA-T33S 10%*	10%
C209	1000		WT18X317	BPD-001	DD-102	BYA10D1M	B-210	5GA-D1	
C210	1000		WT23X8	EF-001	MFT-1000			503C-D1	
C211	.5-3		WT30X30		829-3		CT565A		
C212	1000		WT23X8	EF-001	MFT-1000			503C-D1	
C213	33		WT18X284		TCL-33				N1500 5%
C214	1.0		WT21X24		TCZ-1			5TCCB-V1S 5%*	5%
C215	1.0		WT21X24		TCZ-1			5TCCB-V1S 5%*	5%
C216	22		WT18X402						N470 5%
C217	2.2		WT21X23		TCZ-2R2	C10Q22C		5TCCB-V22S 5%*	5%
C218	5		WT18X362						N2200 5%
C219	10		WT18X360						N80 5%
C220			WT2X101						Stator
C221	.3-2		WT30X45						
C222	1.2		WT21X22					5TCCB-V12S 5%*	5%
C223	.5-3		WT30X30		829-3		CT565A		
C224	1000		WT23X8	EF-001	MFT-1000			503C-D1	
C225	1000		WT18X284	BPD-001	DD-102	BYA10D1M	B-210	5GA-D1	
C226	1000		WT23X8	EF-001	MFT-1000			503C-D1	
C227	1000		WT18X284	BPD-001	DD-102	BYA10D1M	B-210	5GA-D1	
C228	1000		WT23X8	EF-001	MFT-1000			503C-D1	

* Not normally in distributors stock. Available through distributor on order to manufacturer.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

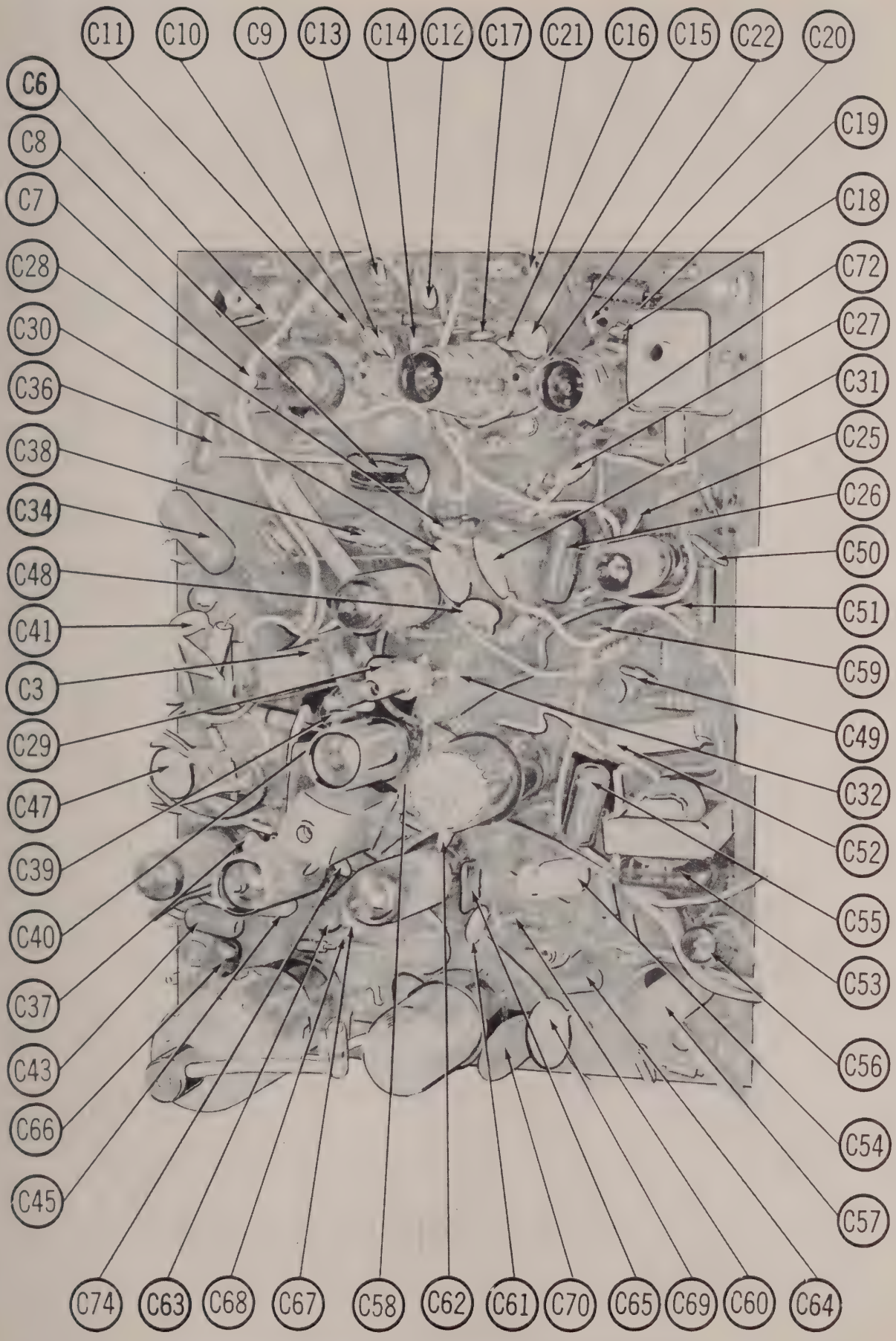
ITEM No.	RATING		G. E. PART No.	NOTES
	OHMS	WATT		
R201	10K			
R202	5600Ω			
R203	100Ω			
R204	82K 5%			
R205	82K 5%			
R206	150K			
R207	22K			

ITEM No.	RATING		G. E. PART No.	NOTES
	OHMS	WATT		
R208	1200Ω			
R209	150K			
R210	22K			
R211	10K			
R212	6800Ω			
R213	10K			

COILS (RF-IF)

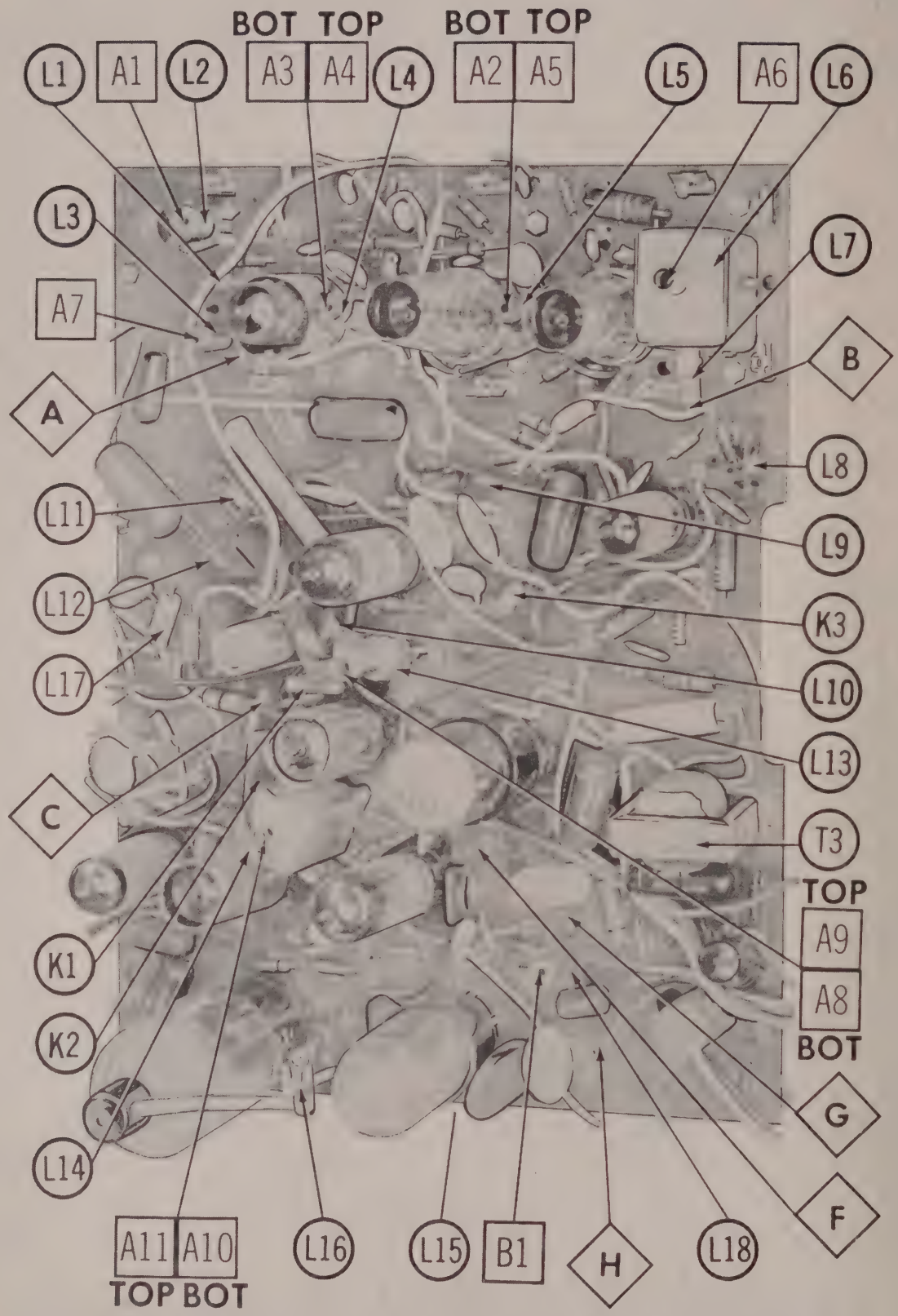
ITEM No.	USE	G. E. PART No.	NOTES
L201	Ant. Trans.	WT37X23	
L202	Ant. Coils	WT52X136	Channel 2-13 Includes wafer assy.
L203	1st RF Coils	WT52X135	Channel 2-13 Includes wafer assy.
L204	2nd RF Coils	WT52X134	Channel 2-13 Includes wafer assy.

ITEM No.	USE	G. E. PART No.	NOTES
L205	Mixer Grid	WT52X133	Channel 2-13 Includes wafer assy.
L206	Osc. Coils	WT52X132	Channel 2-13 Includes wafer assy.
L207	RF Choke	WT36X299	
L208	Mixer Plate	WT36X307	



PRINTED BOARD - CAPACITOR IDENTIFICATION

SET 432 FOLDER 1



PRINTED BOARD - INDUCTOR & ALIGNMENT IDENT

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested Alignment Tools: A1 thru A11 ..... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545

VIDEO IF ALIGNMENT

Set the Volume control fully counterclockwise.
Set the Fine Tuning control fully counterclockwise.
Set the Contrast control fully clockwise.
Connect the negative lead of a 3 volt bias supply to point (A). Positive to chassis.
Remove the Horizontal Output tube (V11) to reduce shock hazards.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.
If a slug has two peak positions, use the one with the slug farthest out of form.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to ungrounded tube shield floating over Mixer-Osc. tube (V202). Low side to chassis.	44.0MC (10MC Swp)	47.25MC	Any non-interfering channel	Vert. Amp. thru 10K to point (B). Low side to chassis. (Across Video Det. load)	A1, A2	Adjust for MINIMUM amplitude at marker.
2.	"	"	"	41.25MC	"	"	A3	"
3.	"	"	"	42.5MC	"	"	A4	Adjust to place marker at 60% on curve as in Fig. 1.
4.	"	"	"	45.75MC	"	"	A5	Adjust to place matker at 45% on curve as in Fig. 1.
5.	"	"	"	42.5MC 45.75MC	"	"	A6	Adjust for proper tilt and symmetry as in Fig. 1.
6.	"	"	"	45.75MC	"	"	A7, & Mixer Plate Coil	Adjust A7 and Mixer Plate Coil for maximum gain at 45.75MC marker. Repeat steps 3, 4, 5 and 6. Replace V11.

4.5MC TRAP ALIGNMENT

Turn the Contrast control fully clockwise.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
7.	.001mfd	High side to point (B). Low side to chassis.	4.5MC (400~ 30% AM Mod)	Any non-interfering channel	Vert. Amp. thru detector network (Fig. 2) to pin 7 (cathode) of picture tube. Low side to chassis.	A8	Adjust for MINIMUM 400~ indication on scope.

SOUND IF ALIGNMENT

A weak TV station signal should be substituted for the signal generator, if possible.
The speaker should be connected during alignment.
Connect the two matched 100K (±1%) resistors in series from point (C) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.01mfd	High side to point (B). Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to point (C). Common to chassis.	A9, A10	Adjust for maximum deflection.
9.	"	"	"	"	DC probe to point (E). Common to point (D).	All	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Repeat steps 8 and 9.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGES 6 & 19.

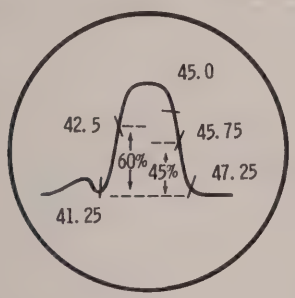


FIG. 1

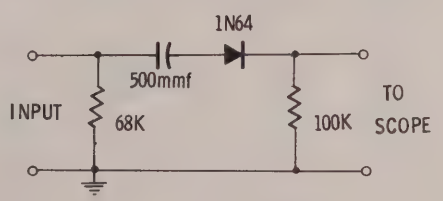


FIG. 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st Video IF	6BZ6	
V2	2nd Video IF	6BZ6	
V3	3rd Video IF	6EW6	
V4	Video Output	12DQ7	
V5	Sound IF Amp.-Horiz. AFC	6EW6	
V6	Ratio Det.-AGC Clamper-AF Amp.	6T8	
V7	Audio Output	6AQ5A	
V8	Sync Sep.	6BY6	
V9	Vert Osc -Vert. Output	6DN7	
V10	Horiz. Mult.	6CG7	
V11	Horiz. Output	6DQ6A	
V12	Damper	6AX4GT	
V13	HV Rect.	1J3GT	
V14	LV Rect.	9U4GB	

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	G.E. PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V15	ZIDEP4	ZIDEP4 ①		ZIDEP4 ②	① "Aluminized" ② "Silver Screen 65"

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA G.E. PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	●60	350	WT3IX188	AFH34-100-20				Q-221 5 MTD-4540	TVL3-4611. 2*
B	●100	350							
C	●40	300							
D	40	75							
C2A	100	6	WT3IX187	AFH3-165-90	C0780 BBR100-6			D-340 MTH-0810	TVL8-3802 *
B	●30	350							
C	●25	25							
C3	4	50	WT3IX133	PRSL50V4	BBR4-50	TT150X4	TD-4-50	MT-1504	TVA-1402
C4	40	450	WT3IX166	PRS450V4	BR4045	TC78	TD-40-450	MT-4540	TVA-1712
C5	4	25NP	WT3IX161 ①	NP-PRS50V4	BBR8-150 † BBR8-150 †	TC504	TD-8-150 † TD-8-150 †	MT-1508 † MT-1508 †	TVA8-1202. 2*

① Not used in some versions.
* Not normally in distributors stock. Available through distributor on order to manufacturer.
† Connect negative leads together.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA G.E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	18		WT16X132		TCZ-18		CNO-418	5TCC-Q18S 10% *	NPO 5%
C7	800		WT18X380	BPD-0008	DD-801	L10T8		5GA-T8	
C8	.15	200	WT25X27	P388N-15		CUB2P15	GEM-2015	2TM-P15	
C9	68		WT16X203		DTZ-68		CNO-468	5TCC-Q68S 5% *	NPO 5%
C10	800		WT16X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C11	560		WT18X383	DI-560	MD-561		JL-356	5GA-T56S 10% *	10%
C12	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C13	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C14	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C15	51		WT16X284		TCZ-51			5TCC-Q51S 5% *	NPO 5%
C16	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C17	470		WT18X383	DI-470	MD-471		JL-347	5GA-T47S 10% *	10%
C18	680		WT18X384	DI-680	MD-681		JL-368	5GA-T68S 10% *	10%
C19	800		WT18X384	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C20	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C21	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C22	800		WT18X385	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C23	3		WT18X271					5TCCB-V3S a. 25mmf	NPO ± .25mmf
C24	5		WT18X101	NPO-DI 5		C10V5C		5TCCB-V5S 10% *	NPO 5%
C25	5000		WT18X66	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C26	.1	200	WT25X24	P388N-1		CUB2P1	GEM-201	2TM-P1	
C27	10000		WT18X199	BPD-01	DD-103	BYA10E	B-110	5HK-S1	
C28	.047	200	WT25X23	P388N-047		CUB2S47	GEM-4147	2TM-S47	
C29	33		WT16X286		DTZ-33		CNO-433	5TCC-Q33S 5% *	NPO 5%
C30	5000		WT18X390	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C31	10000		WT18X199	BPD-01	DD-103	BYA10E	B-110	5HK-S1	
C32	20		WT16X181		DTZ-20			5TCC-Q20S 5% *	NPO 5%
C33	22		WT16X366		DTZ-23		CNO-422	5TCC-Q22S 5% *	NPO 5%
C34	.15	400	WT25X27	P488N-15		CUB4P15	GEM-4015	4TM-P15	
C35	5000		WT18X66	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C36	.047	200	WT25X23	P388N-047		CUB2S47	GEM-4147	2TM-S47	
C37	5000		WT18X388	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C38	5000		WT18X388	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C39	1200		WT18X393				JL-212	5GA-D12S 10% *	10%
C40	5000		WT18X388	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C41	5000		WT18X66	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C42	120		WT18X38	1469-00012		22R5T12		MS-312	5%
C43	.015	600	WT26X24					6TM-S56 10% *	10%
C44	.0082	400	WT25X27				GHM-16282	5BP-D82	10%
C45	.047	400	WT25X26	P488N-047		CUB4S47	GEM-4147	4TM-S47	
C46	10000		WT18X199	BPD-01	DD-103	BYA10E	B-110	5HK-S1	
C47	5000	1000	WT18X199	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C48	5000		WT18X66	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C49	1200		WT18X200	DI-1200			JL-212	5GA-D12S 10% *	10%
C50	10000		WT18X199	BPD-01	DD-103	BYA10E	B-110	5HK-S1	
C51	47		WT16X253	N750-DI 47	DTN-47	C10Q47U	CNT-447	5TCU-Q47S 10% *	N750 10%
C52	.015	600	WT26X24					6TM-S56 10% *	10%
C53	.1	600	WT25X24	P688N-1		CUB6P1	GEM-601	6TM-P1	
C54	.033	400	WT26X47				ACF-1013	8SE-S33S 10% *	10%
C55	.1	400	WT25X24	P488N-1		CUB4P1	GEM-401	4TM-P1	
C56	.01	1600		P168N-01		CUB16E	GEM-1611	16TM-S1	
C57	.033	1000	WT27X16	P1068N-033			ACE-10133	10TM-S33*	
C58	82		WT16X219		TCZ-82	C10Q82U	CNT-482	5TCU-Q82S 10% *	N750 10%
C59	39		WT16X285		TCZ-39	C10Q39U	CNT-439	5TCU-Q39S *	
C60	750		WT18X313	DI-750			JL-375	5GA-T75S 10%	10%
C61	1200		WT18X387	DI-1200			JL-212	5GA-D12S 10%	10%
C62	5000		WT18X390	DI-5000			JL-350	5GA-D5S 10%	10%
C63	.1	200	WT25X24	P388N-1		CUB2P1	GEM-201	2TM-P1	
C64	.0068	600	WT25X29			CUB6D68	GEM-16266	6TM-D68S 10% *	10%
C65	820		WT16X54	1464-00083		1R5T82		MS-382	5%
C66	.1	400	WT25X24	P488N-1		CUB4P1	GEM-401	4TM-P1	
C67	5000		WT18X390	BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C68	820		WT18X386				JL-382	5GA-T82S 10%	10%
C69	10000	1000	WT18X399		DD-103		B-110	10HKH-S1	
C70	280	4000	4T19X374						N1500 10%
C71	.056	600	WT26X23					6TM-S56S 10% *	10%

CAPACITORS (cont)

ITEM No.	RATING CAP	RATING VOLT	REPLACEMENT DATA G.E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C72	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C73	10000	1400	WT18X280		DDK6-103	CUB16S1	2HV-110	20HKB-S1	
C74	800		WT18X380	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C75	2000		WT18X69	BPD-003	DD-202	BYA10D2	B-220	5HK-D2	
C76	800		WT18X84	BPD-0008	DD-801	L10T8	B-210	5GA-T8	
C77	800		WT18X84	BPD-0008	DD-801	L10T8	B-210	5GA-T8	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA G.E. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500K	½	WT49X280					Tone
B	1meg	½						Volume, Tap ⑤ 500K
C	Switch							Push Push Type
R2	200K	½	WT49X278					Brightness
R3	17K	½	WT49X262					Contrast, Tap ⑤ 10K
								Stop ⑤ 3000Ω
R4A	300K	½	WT49X279	B-50	A47-250K-S	QU-130	U46	Vert. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R5A	1meg	½	WT49X225	BX-69	A47-1meg-S	QU-137	TA16L	Horiz. Hold
B	Shaft			Not Req.	KS6-3	Not Req.	Not Req.	
R6A	3meg	½	WT49X266	BX-94	A47-3meg-S	QU-140	SU-59	Height
B	Shaft			Not Req.	FKS-1/4	TQ	Not Req.	
R7A	2000Ω	2(WW)	WT49X277					Vert. Linearity
B	Shaft							
R8A	50K	½	WT49X282			B13-123	TA54A	Volume - Remote Unit
B	Shaft					TM-2	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise noted.

ITEM No.	RATING OHMS	RATING WATT	G.E. PART No.	NOTES
R9	33Ω			
R10	5600Ω			
R11	1000Ω			
R12	12K			
R13	47K			
R14	10K			
R15	1000Ω			
R16	4.7meg			
R17	13K			
R18	47Ω			
R19	22K			
R20	5600Ω	2		
R21	220Ω			
R22	180Ω			
R23	82K			
R24	270K 5%			
R25	75K 5%			
R26	3300Ω 5%			
R27	8200Ω			
R28	330K			
R29	68Ω			
R30	22K			
R31	180K			
R32	12K			
R33	1.5meg			
R34	2200Ω			
R35	33K			
R36	1.5meg			
R37	56K			
R38	200K 5%			
R39	100K			
R40	2.2meg			
R41	22meg 5%			
R42	5600Ω			
R43	33K	1		
R44	10K	1		
R45	22K			
R46	2meg 5%		Note 1	
R47	22Ω			
R48	33K			
R49	120Ω			
R50	470K			

Note 1. Some versions may use 3.3meg in this application.

ITEM No.	RATING OHMS	RATING WATT	G.E. PART No.	NOTES
R51	470K			
R52	680Ω			
R53	470Ω			
R54	2meg 5%			
R55	47K	1		
R56	33K			
R57	33K	1		
R58	18K	1		
R59	330Ω			
R60	1.5meg			
R61	1 meg Cold 600K Hot		WT14X118	
R62	5600Ω 5%			
R63	1.5meg			
R64	1000Ω	1		
R65	1000Ω			
R66	1000Ω			
R67	4700Ω			
R68	470K			
R69	330K			
R70	1meg			
R71	82K			
R72	18K	1		
R73	820K			Note 2
R74	68K			
R75	47K			
R76	33K			
R77	12K			
R78	8200 5%			
R79	820K			
R80	100Ω			
R81	10K	3	WT14X126	
R82	2200Ω			
R83	5100Ω	7	WT14X119	
R84	1500Ω			
R85	3600Ω	5	WT14X130	
R86	3900Ω	10	WT14X129	
R87	470K			
R88	330Ω			
R89	330Ω			
R90	470Ω			

Note 2. Some versions may use 1meg in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA G.E. PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	RF Choke	WT16X333					.1 Microhenry
L2	47.25MC Trap	WT16X336					Includes C8
L3	1st Video IF	WT16X260					
L4A	2nd Video IF	WT6LX96					Includes C9
B	4l. 25MC Trap						
L5A	3rd Video IF	WT6LX94					Includes C15
B	47.25MC Trap						
L6A	4th Video IF Assy.	WT56X45					Includes C33, C34, M4
B	RF Choke	(WT56X326)					.22 Microhenry
C	RF Choke						6.8 Microhenries
L7	RF Choke	WT16X280	19-1008	BC-565	4609		5.6 Microhenries ①
L8	Shunt Peaking Coil	WT16X257	19-3160	TV-184	6160	VF-5	180 Microhenries
L9	Series Peaking Coil	WT16X387	19-1015		4631		82 Microhenries
L10	Shunt Peaking Coil	WT16X376	19-3860	TV-206	6148		750 Microhenries
L11	Shunt Peaking Coil	WT16X271	19-3500	TV-208	6138	VF-8	470 Microhenries
L12	Series Peaking Coil	WT16X375					300 Microhenries
L13	Sound Take-off	WT16X355					
L14	Ratio Detector	WT16X47					Includes 220Ω resistor and 120mmf cap.
L15	RF Choke	WT16X106	19-1005	BC-566	4612		10 Microhenries ②
L16	RF Choke	WT16X105	19-1005	BC-566	4612		10 Microhenries ②
L17	RF Choke	WT16X260	19-1008	BC-565	4609		5.6 Microhenries ①

① IRC Part #CLA. ② IRC Part #CL-1.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA G.E. PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Thordarson PART No.	NOTES
L18	74Ω		WT24X349						

FILTER CHOKE

ITEM No.	RATINGS CURRENT-(Measured)	RATINGS DC RES.	RATINGS INDUCTANCE (0 CURRENT 1000 ^Cu)	REPLACEMENT DATA G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L19	.270A	53Ω	1.2 Hy.	WT63X52					26C44	C-33X

COILS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA G.E. PART No.	Halldorson PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Rogers PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L20	Width Choke	WT36X388								

TRANSFORMER (POWER)

ITEM No.	RATING PRI	RATING SEC 1	RATING SEC 2	REPLACEMENT DATA G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117v ⑤1. 85A	580VCT ④. 270A	5V ③ 3A	WT88X34						
	SEC 3	SEC 4	SEC 5							
	24V ⑥2.5A tap ⑦ 6.3V ⑥8.8A									

TRANSFORMER (REMOTE CONTROL)

ITEM No.	RATING PRI.	RATING SEC 1	RATING SEC 2	REPLACEMENT DATA G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	117v ⑤. 05A	24V ⑤. 001A		WT64X73	F5527	P2962		P8469	26F68	F-40X

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Rogers PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T3	Vert. Osc.	WT64X65		A-3004 ⑦			A-8126①	26A03 ①	A-130Z ①
T4	Vert. Output	WT64X66	Z1807 ②	A-3037	V-312 ③		VO-101 ③	Y-51 ⑤	A-119X ③
T5	Yoke-Horiz. (12MH) (QDP)-Vert. (40MH)	WT76X27							
	Rear Cover & Centering Device	WT42X68							
	Yoke Clamp	WT5X33							
T6	Horiz. Output	WT77X42							

① Bend tabs down into board and connect green and blue to cathode, yellow to C52 and red to ground.
② Cut and tape blanking winding.
③ Drill new mounting hole(s).
④ Connect yoke terminal #5 to terminal #4 of T6, yoke terminal #6 to C71. Mount C71 external and use new yoke clamp.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T7	16K	3-4Ω	WT64X72	Z1002	A-2901	AU-600	A-3823	22S87	S-53X	

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA G.E. PART No.	QUAM PART No.	NOTES
SP1	8" x 12"	PM	3-4Ω	WT95X34 ①	4AITZ5	① Models 21C2550, 21C2551
SP2	4"	PM	4-8Ω	WT95X33 ②		② Models 21C2550, 21C2551, 21C2560, 21C2561, 21L2555, 21L2558
	9" x 21"	PM	3-4Ω	WT95X25 ③		③ Models 21C2560, 21C2561, 21L2555, 21L2556, 21L2557
	4" x 6"	PM	3-4Ω	WT95X23 ④		④ Models 21C2555, 21C2556

COMPONENT COMBINATIONS

ITEM No	USE	DESCRIPTION	G.E. PART No	REPLACEMENT DATA	
K2	Sound IF Cathode	470mmf, 180Ω	WT24X4		
K2	De-Emphasis & Coupling	1000mmf, 15000mmf, 1200mmf, 22K	WT33X22		
K3	Sync Coupling	470mmf, 470K	WT24X3	Centralab Sprague	RC-465 PRC-3

GENERAL ELECTRIC MODELS 21C2535, 36, 50, 51, 60, 61, 21L2555, 56, 57 & UHF (U3 Line)

FOLDER 1

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			G. E. PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	N	4A 125V S/B	WT10X21	WT38X60	333004 (N-4A-125V-S/B)	346019	N4	HN 3½ to 5
M2	N	4/10A 125V S/B	WT10X22	WT38X61	333.400 (N-4/10A-125V-S/B)	346009	N 4/10	HN 3/10 to 1/2
M3	1" Length of #26 Copper Wire							

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		G. E. PART No.	CBS PART No.	SYLVANIA PART No.	
M4	1N87A	WT16X1	1N60	1N295	Video Detector (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	G. E. PART No.	NOTES
M5	Lamp		#44
M6	Tuner	WT86X77	VHF
	Tuner	WT86X78	VHF, with UHF provisions
	Tuner	WT85X24	UHF
M7	Switch	WT39X3	Local-Distance, DPDT (Slide Type)
M8	Switch	WT39X3	Phono-TV, DPDT (Slide Type)
M9	Switch	WT39X5	Width Selector (Rotary Wafer Type)
M10	Relay	WT62X17	
M11	Switch	WT92X200	Detent Assy. (Includes Contact Spring with Silver Contact, Spacer and Bracket with Silver Contact)
M12	Switch	WT5X26	Program Assy. (Includes Contact Springs with Silver Contact and fibre bracket)
M13	Motor Assy.	WT72X3	Includes Gear Box and Muting Switch
M14	Switch		Remote Control On-Off (Pushbutton Type)
M15	Switch		Remote Control Channel Selector (Pushbutton Type)
	Magnet	WT42X31	Beam Alignment (Used only when necessary to improve focus)

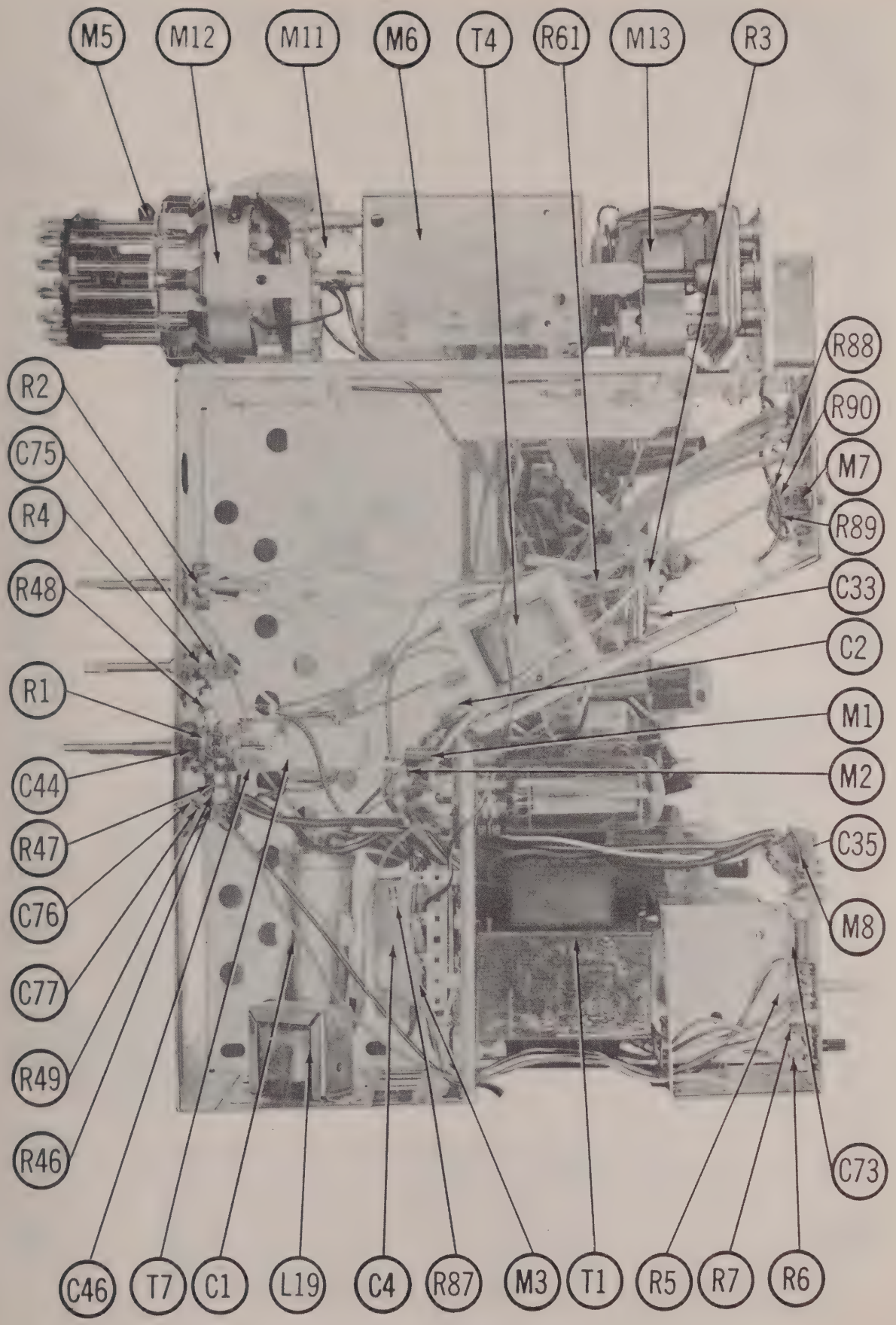
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

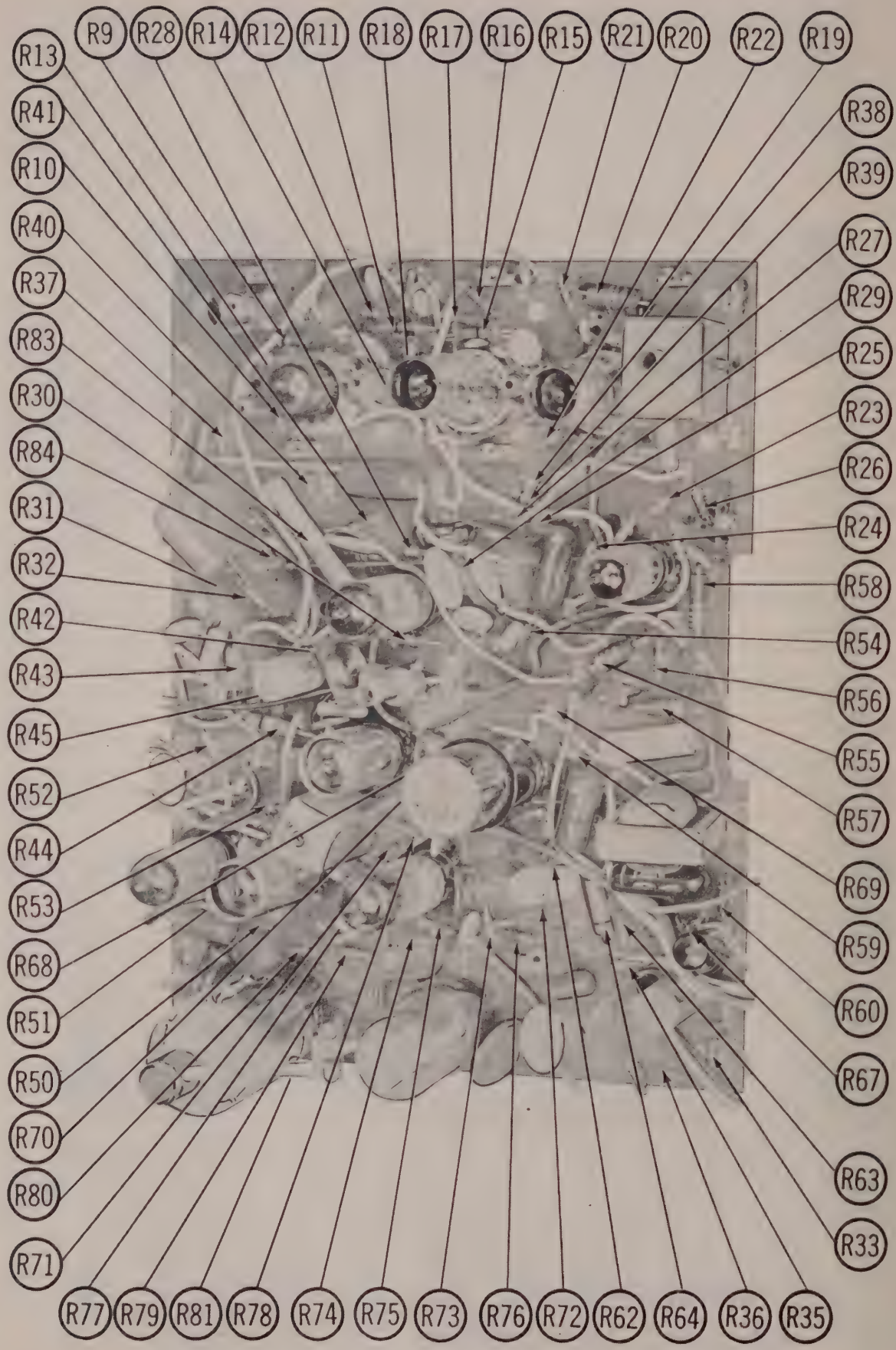
NAME	PART NO.	DESCRIPTION
Safety Glass	WT94X69	
Mask	WT96X44	Models 21C2550, 21C2551, 21C2560, 21C2561
Mask	WT96X47	Models 21C2535, 21C2536, 21L2555, 21L2556, 21L2557
Pushbutton	WT43X283	Selector
Knob	WT43X275	UHF Selector
Knob	WT43X277	UHF Indicator
Knob	WT43X276	Volume, Contrast, Vert.
Knob	WT43X285	Remote Volume
Knob	WT43X260	Brightness
Knob	WT43X274	Tone, Includes Black Indicator
Pushbutton	WT47X34	Remote Selector, Remote On-Off
Cover	WT21X132	Bottom
Case	WT89X111	Chrome
Cabinet	WT103X152	Simulated Mahogany, Model 21C2550
Cabinet	WT103X153	Simulated Oak, Model 21C2551
Cabinet	WT103X165	Simulated Mahogany, Model 21C2535
Cabinet	WT103X166	Simulated White Oak, Model 21C2536
Cabinet	WT103X167	Simulated Mahogany, Model 21L2555
Cabinet	WT103X168	Simulated White Oak, Model 21L2556
Cabinet	WT103X169	Simulated Cherry, Model 21L2557
Cabinet	WT103X173	Mahogany, Model 21C2560
Cabinet	WT103X174	White Oak, Model 21C2561
Legs	WT78X63	Models 21C2550, 21C2551
Legs	WT78X66	Model 21C2535
Legs	WT78X67	Model 21C2536
Swivel Base	WT101X119	Includes legs and glides, Model 21C2550
Swivel Base	WT101X120	Includes legs and glides, Model 21C2551
Base	WT101X141	Mahogany, Model 21L2555
Base	WT101X142	White Oak, Model 21L2556
Base	WT101X143	Cherry, Model 21L2557

WIRING DATA

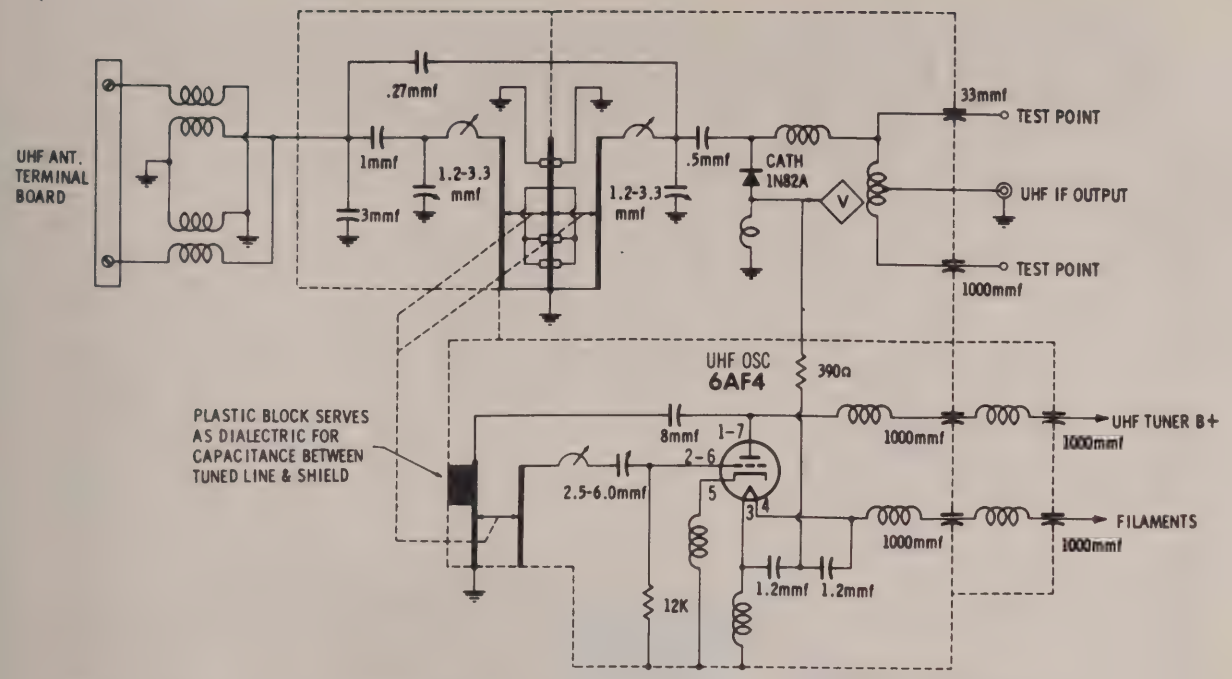
High Voltage Lead	Use BELDEN No.	8869
Shielded Hook-up Wire	Use BELDEN No.	8885 (Single Conductor)
		8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No.	8530 (Solid) Available in Ten Colors
		8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No.	8874
300Ω Tuner Input Lead	Use BELDEN No.	8225
300Ω Antenna Lead-in	Use BELDEN No.	8230 or 8275
Antenna Rotor Cable	Use BELDEN No.	8464 (Flat) or 8484 (Round) - 4 Conductor
		8485 (Round) - 5 Conductor
		8488 (Round) - 8 Conductor



CHASSIS - SIDE VIEW



PRINTED BOARD - RESISTOR IDENTIFICATION



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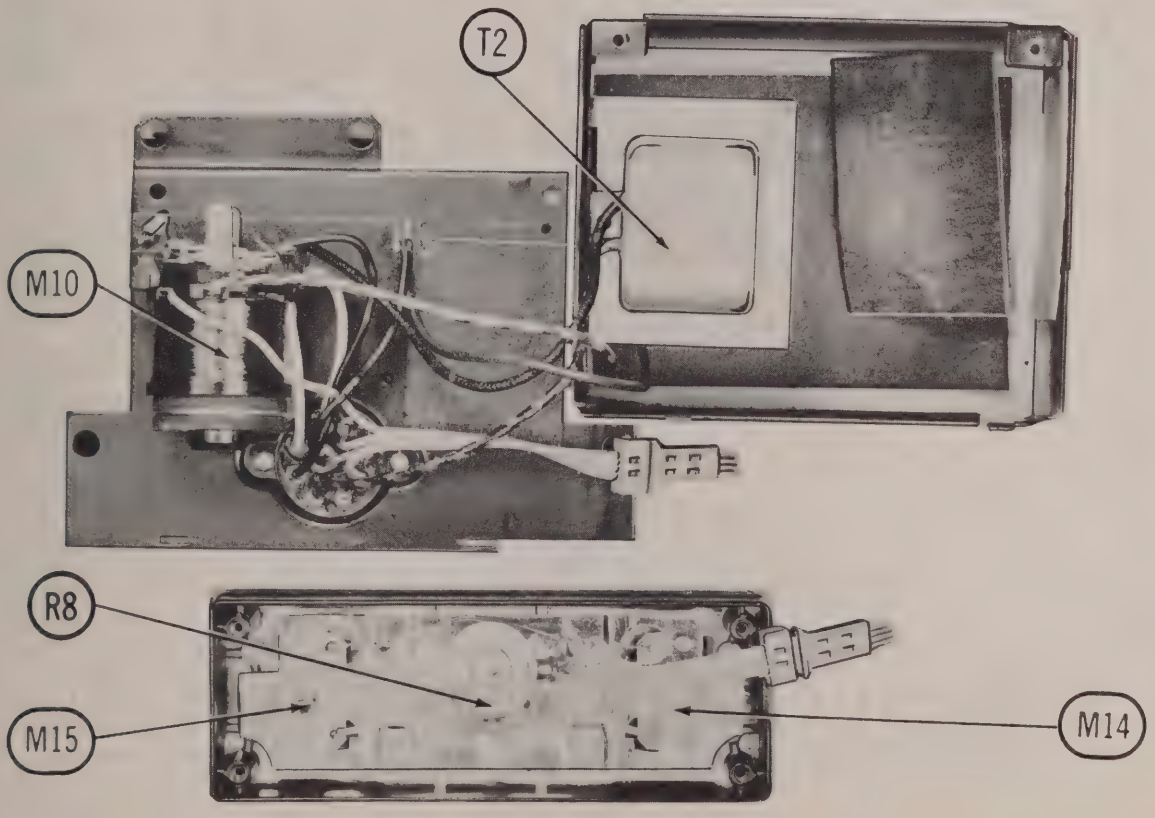
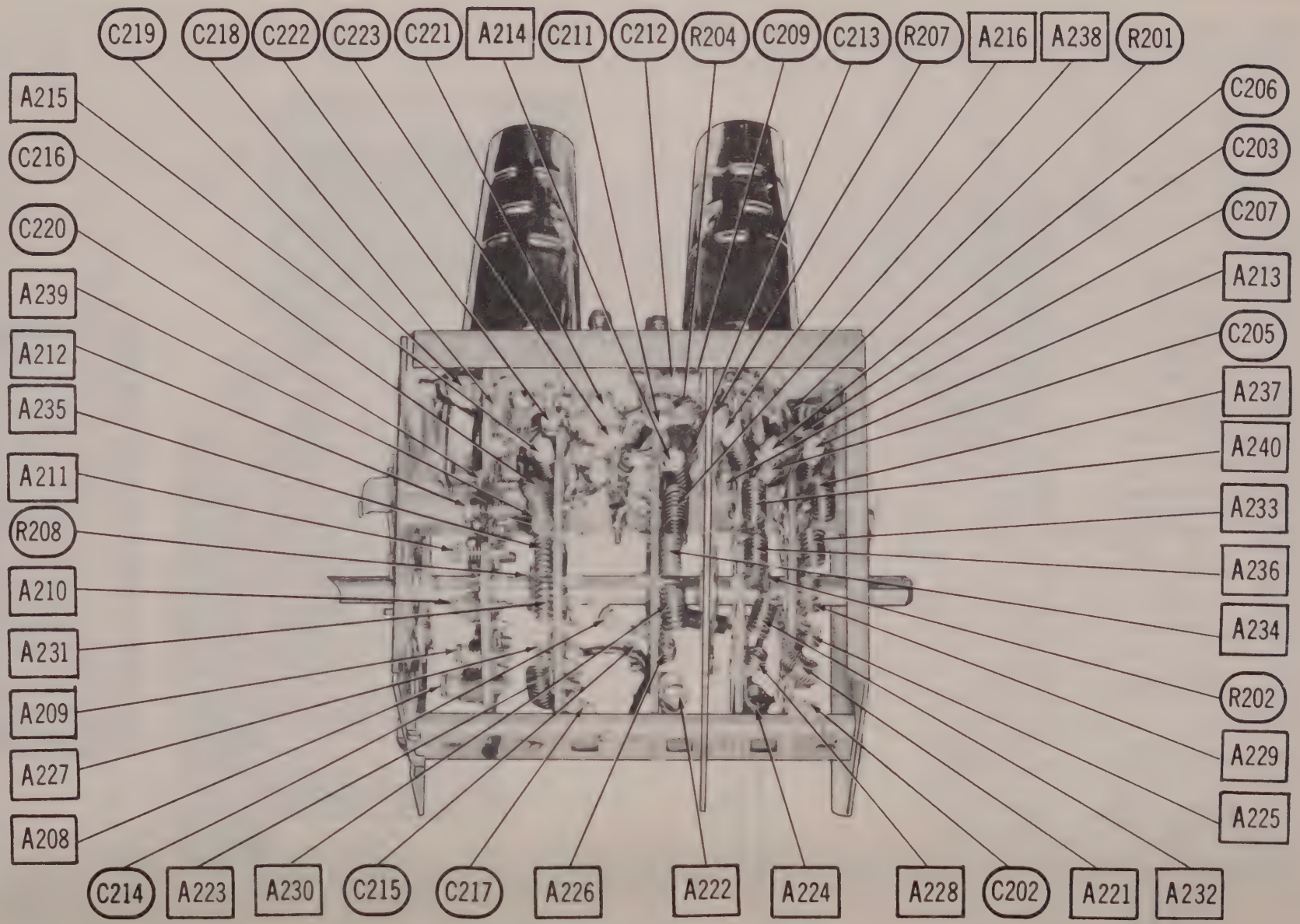
UHF TUNER WT85X24



REMOTE TUNING UNIT



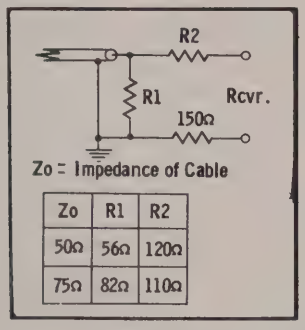
TUNER WT86X77 - RIGHT SIDE

TUNER ALIGNMENT INSTRUCTIONS (cont)

UHF IF ALIGNMENT

Connect bias as under "VHF RF and Mixer Alignment".
Disconnect IF Output and terminate with a 68Ω resistor at the open end.
Remove UHF Mixer Crystal.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Direct	High side to point ⓥ. Low side to chassis.	43.5MC (10MC Swp)	40.5MC 45.75MC	UHF Tune UHF for MINIMUM tilt over center tuning area	Vert. Amp. thru 10K to point ⓤ. Low side to chassis.	A241, A242, A243, A244	Adjust A241 for correct placement of 40.5 MC marker. (See Fig. 205). Adjust A242 and A243 for maximum gain and symmetry. Adjust A244 for maximum gain and zero tilt.



Zo	R1	R2
50Ω	56Ω	120Ω
75Ω	82Ω	110Ω

FIG. 201

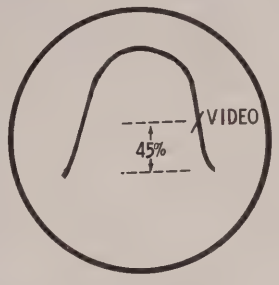


FIG. 202

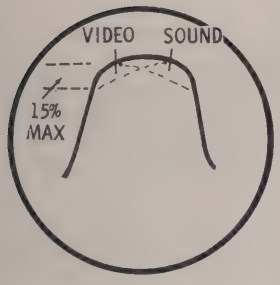


FIG. 203

FIG. 204

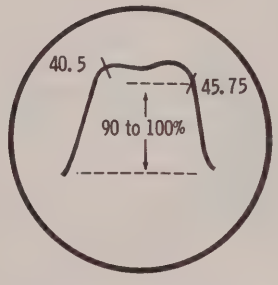
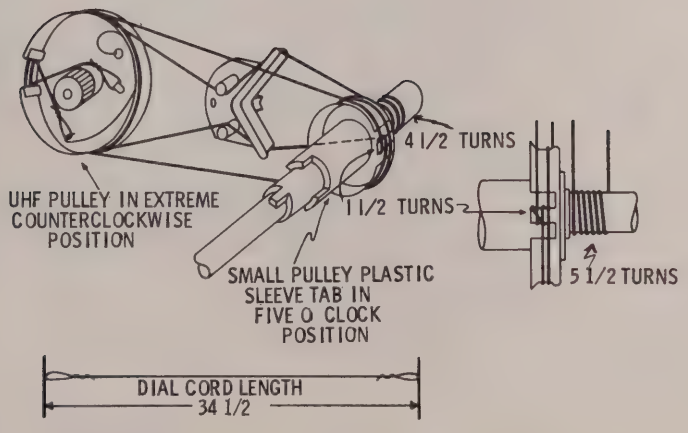
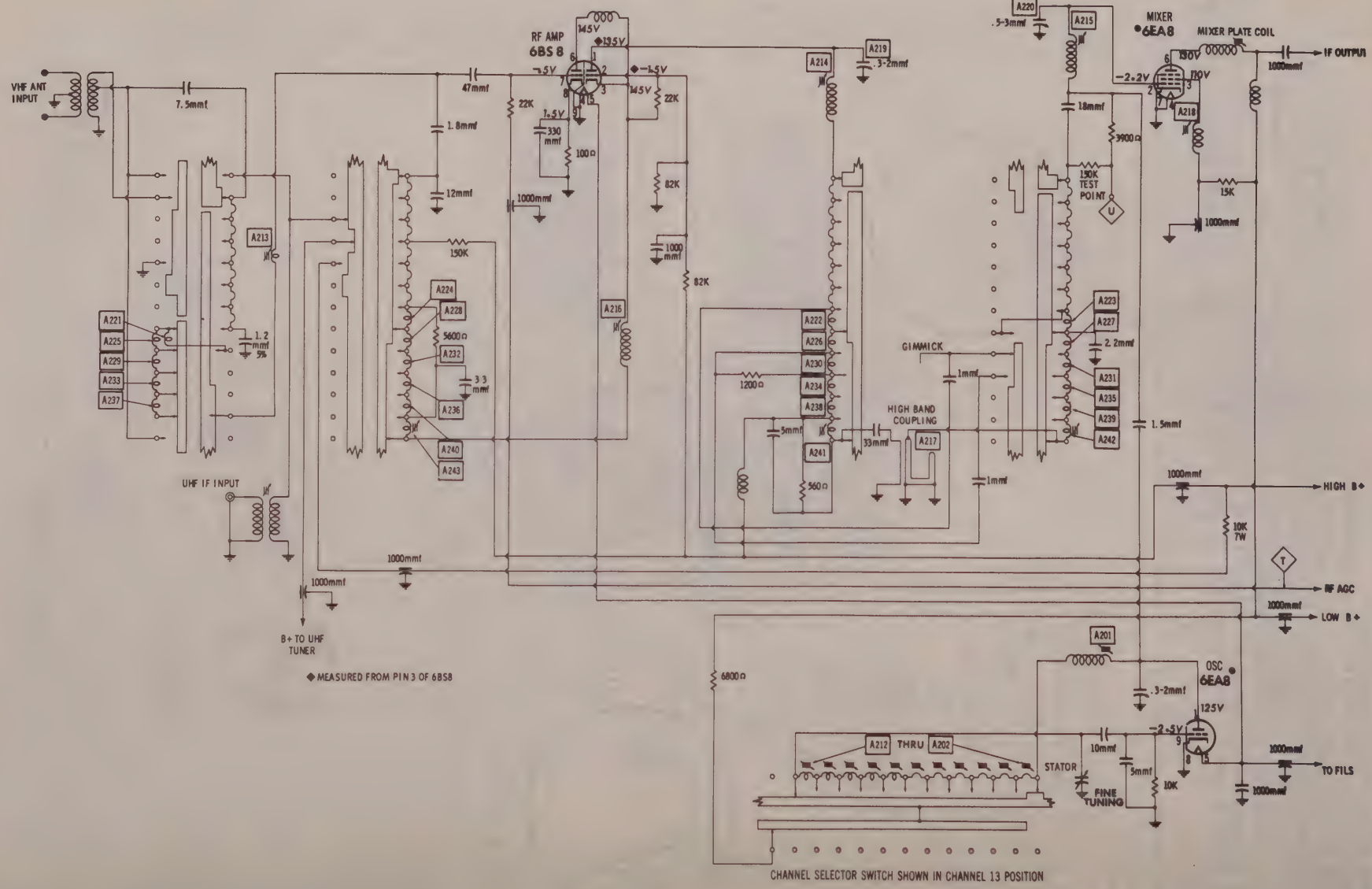


FIG. 205


4 1/2 TURNS
UHF PULLEY IN EXTREME COUNTERCLOCKWISE POSITION
1 1/2 TURNS
5 1/2 TURNS
SMALL PULLEY PLASTIC SLEEVE TAB IN FIVE O CLOCK POSITION
DIAL CORD LENGTH
34 1/2

UHF DRIVE CORD STRINGING



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VHF TUNER WITH UHF PROVISIONS WT86X78

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BZ6	455K	47Ω	.1Ω	0Ω	†4600Ω	†16K	0Ω		
V2	6BZ6	460K	47Ω	.1Ω	0Ω	†4600Ω	†16K	0Ω		
V3	6EW6	.1Ω	120Ω	.1Ω	0Ω	†5800Ω	†28K	0Ω		
V4	12DQ7	68Ω	330K	0Ω	.1Ω	.1Ω	0Ω	†4800Ω	†3900Ω	0Ω
V5	6BW8	800K	330K	0Ω	.1Ω	0Ω	2.5Ω	180Ω	†40K	†14K
V6	6T8	INF	22K	INF	0Ω	.1Ω	590K	0Ω	3meg	†470K
V7	6AQ5A	470K	470Ω	0Ω	.1Ω	†1700Ω	†3900Ω	470K		
V8	6BY6	†4.7meg	0Ω	.1Ω	0Ω	†45K	†22K	2.3meg		
V9	6DN7	1.5meg	‡2800Ω	• 2100Ω	• 550K	• ‡4.5meg	125Ω	0Ω	.1Ω	
V10	6CG7	†15K	1.8meg	820Ω	0Ω	.1Ω	†80K	68K	820Ω	0Ω
V11	6DQ6A	TP	0Ω	TP	†10K	820K	TP	.1Ω	0Ω	TOP CAP ‡34Ω
V12	6AX4GT	TP	NC	¶1meg	NC	†0Ω	TP	0Ω	.1Ω	
V13	1J3GT	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP ‡366Ω
V14	5U4GB	NC	¶	NC	26Ω	NC	24Ω	TP	¶	
V15	21DEP4	.1Ω	35K	‡1.5meg	0Ω	NC	35K	• 230K	0Ω	
V201	6BS8	†0Ω	50K	75K	0Ω	.1Ω	75K	700K	100Ω	0Ω
V202	6EA8	†11K	170K	†14K	0Ω	.1Ω	†3900Ω	0Ω	0Ω	10K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.

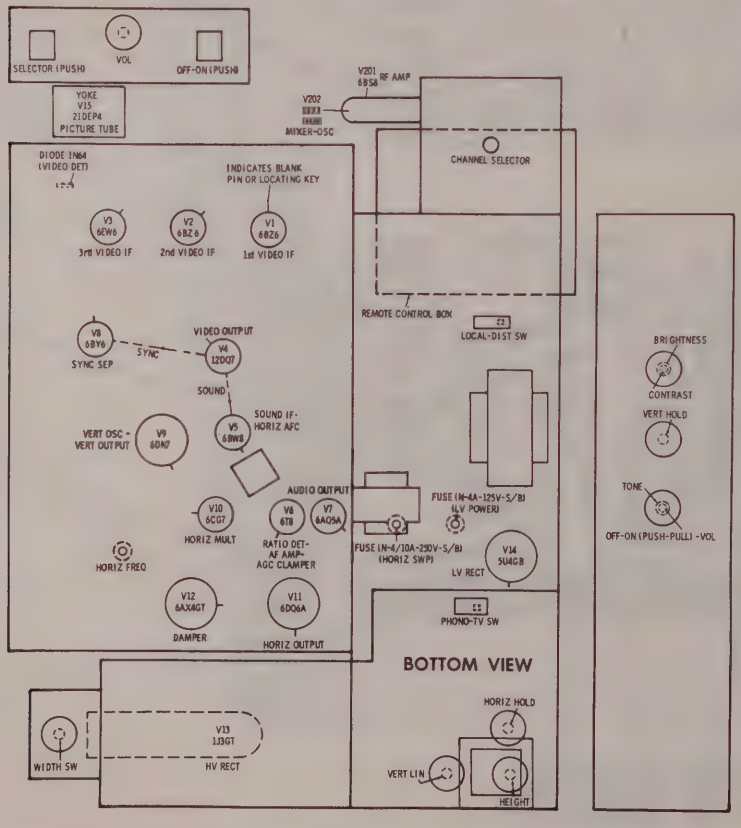
• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.

† MEASURED FROM 280V SOURCE.

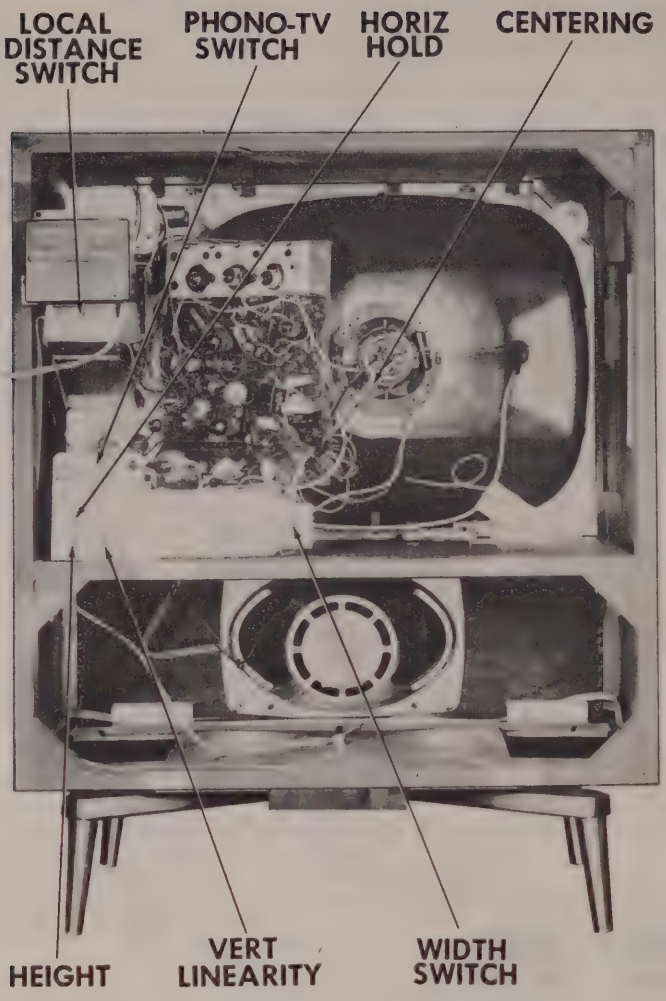
‡ MEASURED FROM PIN 3 OF V12.

NC NO CONNECTION

TP TIE POINT



TUBE PLACEMENT CHART



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

Connect a clip lead from point Ⓕ to chassis.

Parallel the Horizontal Frequency coil with a 1000Ω resistor from point Ⓖ to point Ⓗ

Adjust the Horizontal Hold control until the picture appears to float back and forth across the screen.

Remove the 1000Ω resistor and adjust the Horizontal Frequency slug (B1) until the picture again appears to float back and forth across the screen.

Remove the clip lead between point Ⓕ and chassis.

PHOTOFACT* Folder

IMPORTANT FILING NOTICE

The TV Folder for this envelope will be found among the first folders in this complete Set of folders.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

SETCHELL-CARLSON
MODEL P65 (Ch. C105)

SETCHELL-CARLSON
MODEL P65 (Ch. C105)

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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DATE 2-59

SET 432 FOLDER 2

SET 432 FOLDER 2

SETCHELL-CARLSON
MODEL P65 (Ch. C105)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type knobs from the top.
2. Remove 4 metal screws holding rear cover. Remove the rear cover.
3. Remove 4 bottom chassis bolts.
4. Remove chassis.

TRADE NAME	Setchell-Carlson	MODEL P65	CHASSIS C105
MANUFACTURER	Setchell-Carlson Inc., New Brighton, Minn.		
TUBES	Seventeen		
POWER SUPPLY	110-120 Volts AC, 60 Cycle	RATING 125 Watts, 1.22 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

SETCHELL-CARLSON
MODEL P65 (Ch. C105)

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF Oscillator is possible by removing the Channel Selector and Fine Tuning knobs. Set the Fine Tuning at the center of its range. One slug for High band adjustment is located at 1 o'clock, and should be adjusted first. The Low band adjustment is located at 6 o'clock. Adjust for best picture and sound.

SAFETY GLASS REMOVAL

Remove 4 phillips screws holding front. Remove front.

SPECIAL ADJUSTMENTS

A. AGC
No provision is made to vary the AGC on this receiver.

B. Focus
No provision is made to vary the focus on this receiver.

C. Picture Tube Saver
A plug is provided to plug into the Picture Tube Save to increase filament voltage on the Picture Tube to 7.6 volts AC.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

The Horizontal Hold control is the only adjustment for the Horizontal Multivibrator Frequency.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate intercarrier buzz, adjust the Ratio Detector secondary (A10) located on top of chassis.

FUSE

One fuse is used for low voltage power supply protection. (For location, see tube placement chart.)

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

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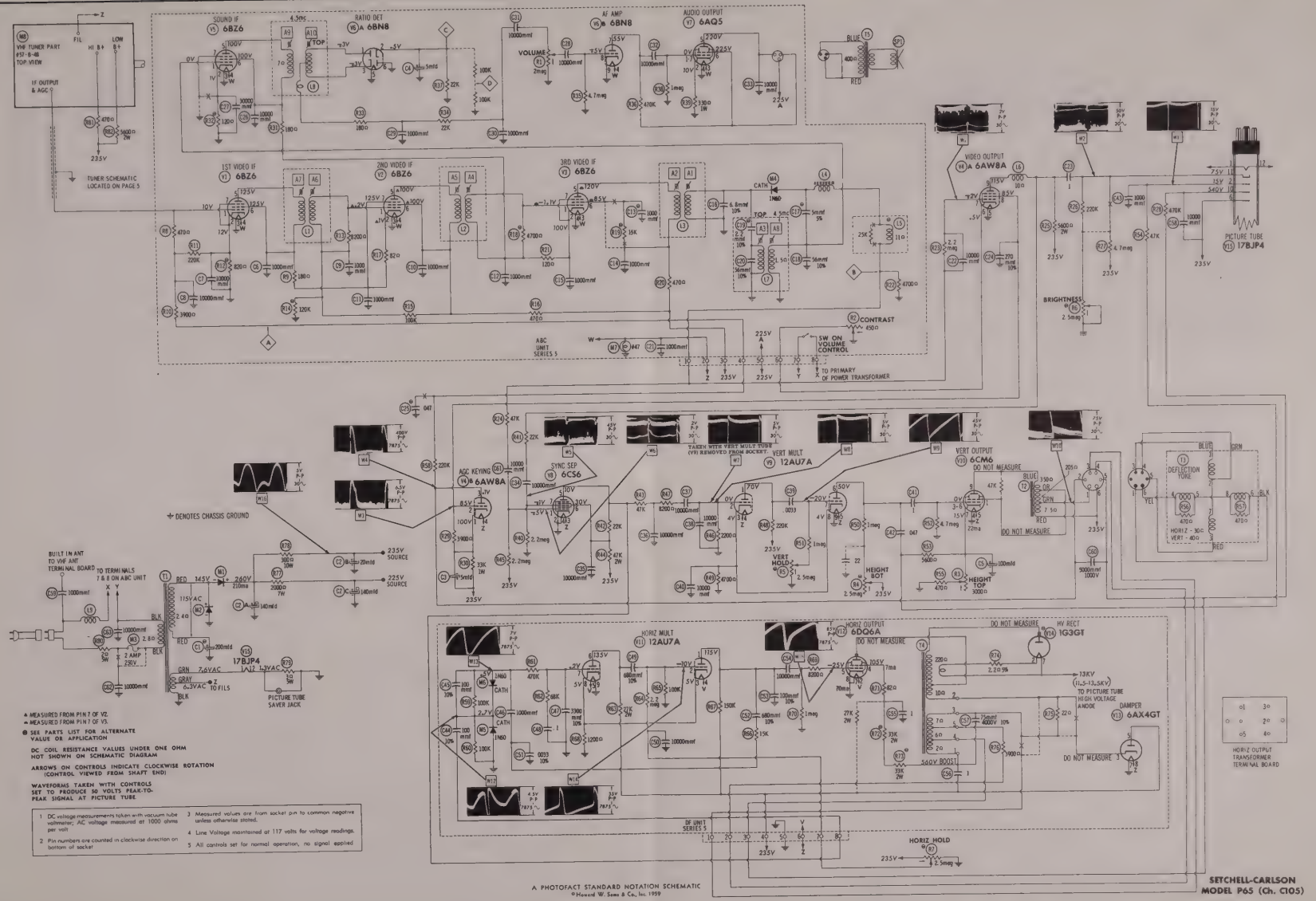

▲ MEASURED FROM PIN 7 OF V2.
▲ MEASURED FROM PIN 7 OF V3.
⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltage measured at 1000 ohms per volt.
2. Pin numbers are counted in clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line Voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation, no signal applied.

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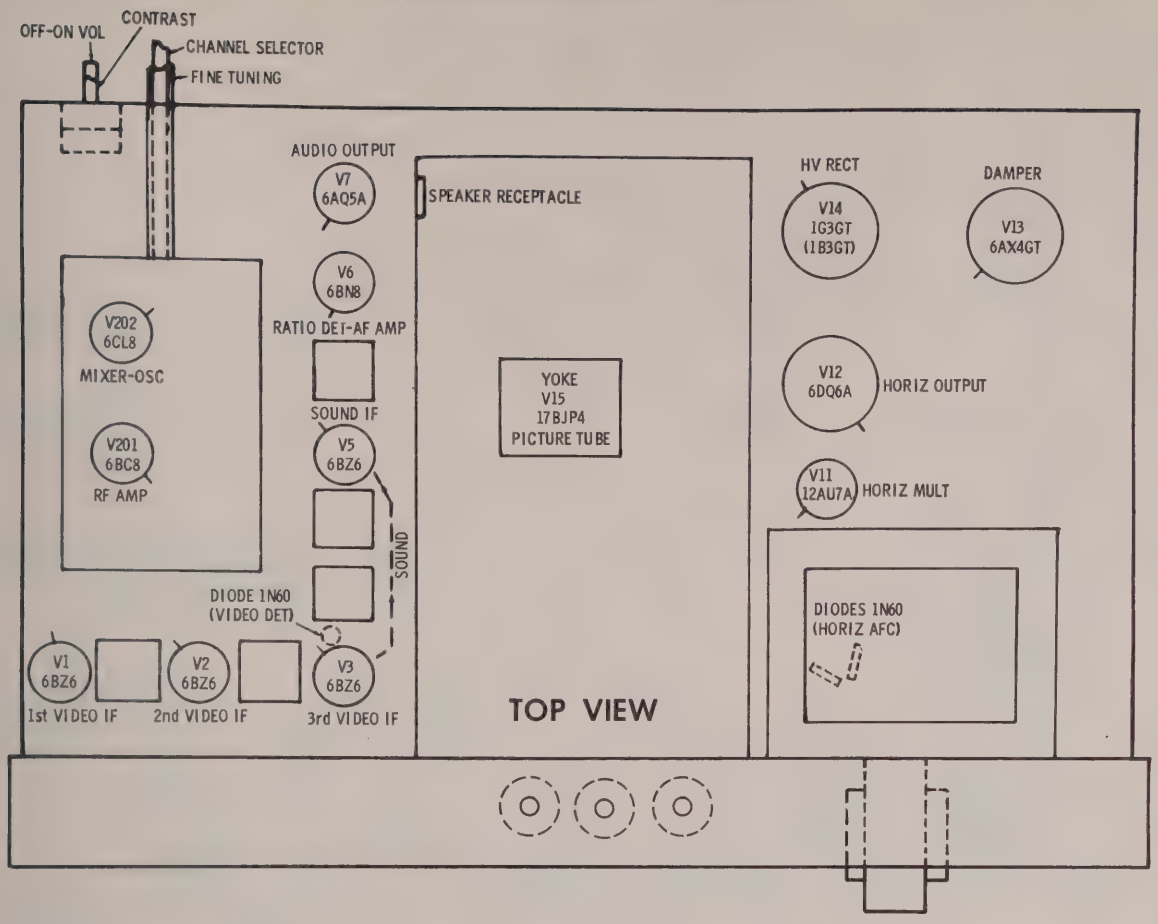
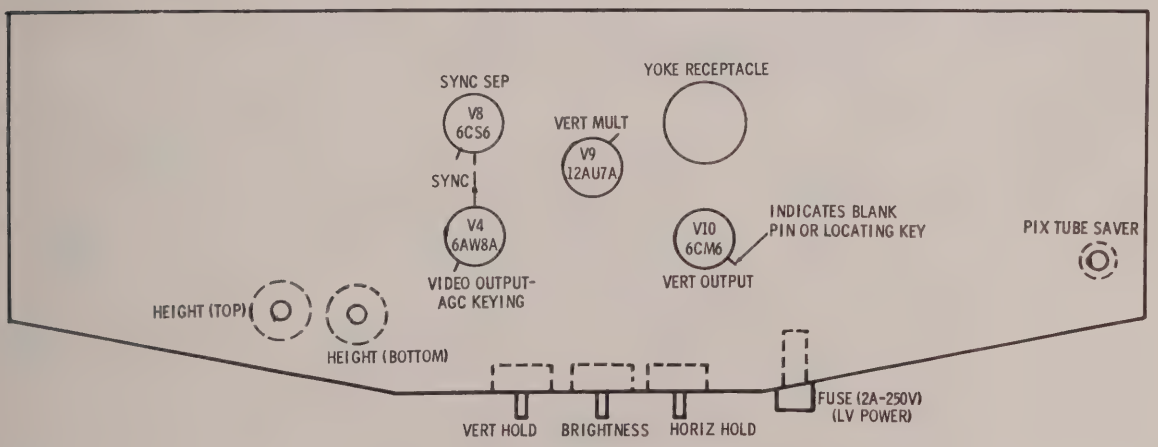
SETCHELL-CARLSON
MODEL P65 (Ch. C105)

TUBE PLACEMENT CHART





TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound Fuse (2A), Rectifier (B+)

SWEEP FAILURE
No raster, has sound Diode (Horiz. AFC), V11, V12, V13, V14, V15
No vertical deflection V9, V10
Poor vert. linearity or foldover V9, V10
Poor horiz. linearity or foldover V11, V12, V13
Narrow picture V11, V12, V13, Rectifier (B+)
Vert. off freq. V9
Horiz. off freq. V11

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, V3, Diode (Video Det)
No pic, no sound, has snow V201, V202, V1
No pic, has sound, has raster V4, V15
Has pic, no sound V5, V6, V7
Overloaded picture V4

SYNC FAILURE
No vert. sync V8, V9
No horiz. sync V8, Diode (Horiz. AFC)
No vert. or horiz. sync V8

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

Allow a 20 minute warm-up period for the receiver and test equipment.
The high voltage lead should be securely taped and kept away from the chassis.
Suggested alignment tools: A1 thru A10 ..... General Cement #8606, 8606L, 8282, 9295
Walsco #2526, 2543, 2544, 2545

VIDEO IF ALIGNMENT

Connect the negative lead of a 9 volt bias supply to point (A). Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001mfd	High side to pin 1 (grid) of 6BZ6 (V3). Low side to chassis.	44MC (10MC Swp)	45.75MC 47.25MC	Any non-interfering channel	Vert. Amp. thru 10K to point (B). Low side to chassis. (Across Video Det. load)	A1, A2, A3	Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown. Adjust A3 to place the 47.25MC marker in trap notch.
2.	"	High side to pin 1 (grid) of 6BZ6 (V2). Low side to chassis.	"	41.25MC 45.75MC	"	"	A4, A5	Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown.
3.	"	High side to pin 1 (grid) of 6BZ6 (V1). Low side to chassis.	"	"	"	"	A6, A7	"
4.	Direct	Place a thin insulated metal strip between the Mixer-Osc. tube (V202), and tube shield. Connect the high side of sweep generator to the metal strip. Low side to chassis.	"	"	"	"	Mixer Plate Coil	Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown. Repeat steps 1 thru 4, if necessary.

SOUND IF ALIGNMENT

Connect two matched 100K (±1%) resistors in series from point (C) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5.	.001mfd	High side to point (B). Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to point (C). Common to chassis.	A8, A9	Adjust for maximum deflection.
6.	"	"	"	"	DC probe to point (D). Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGE 6

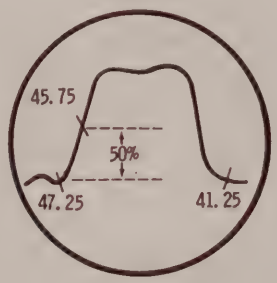
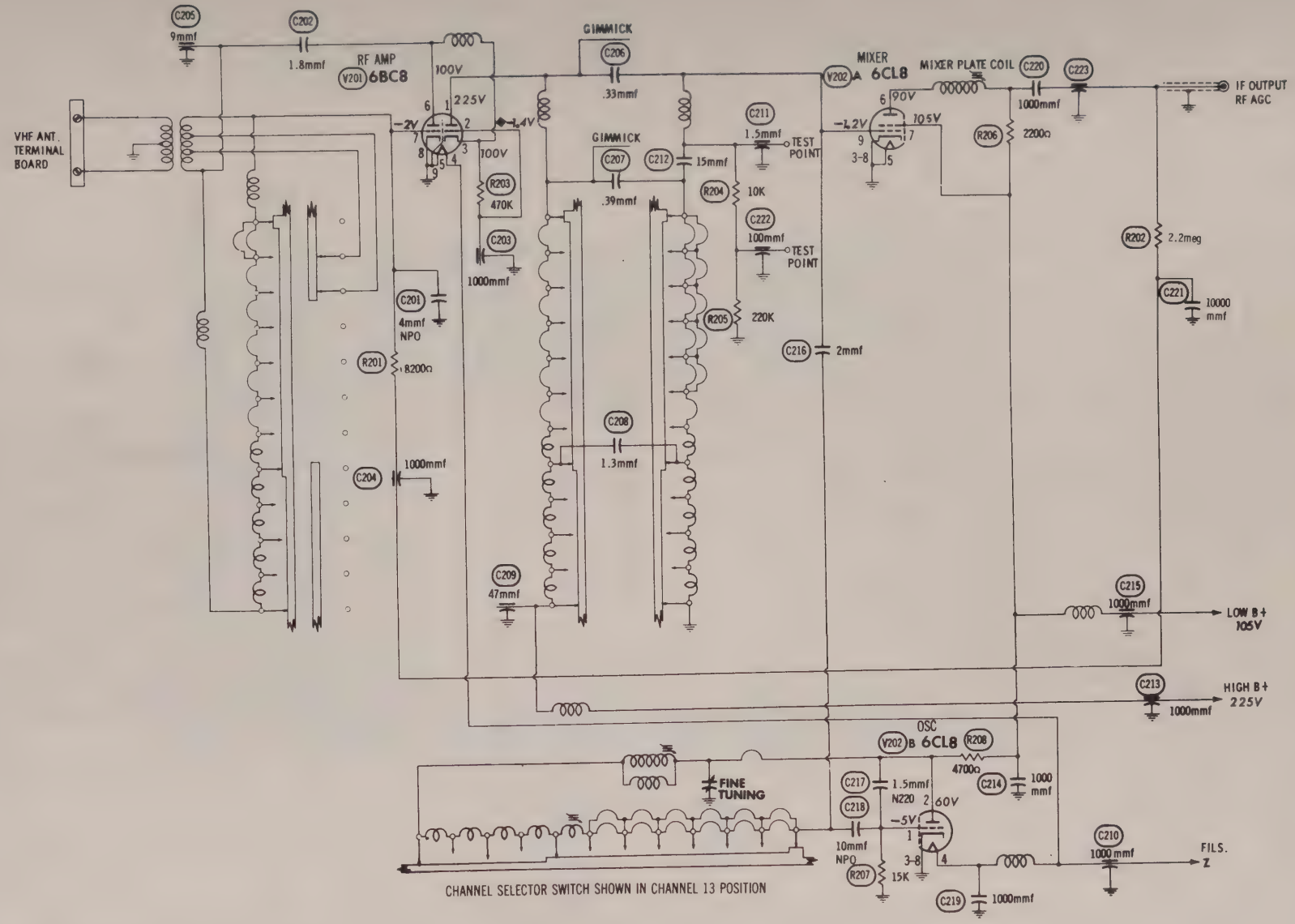


FIG.1



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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VHF TUNER #57B48

SETCHELL-CARLSON MODEL P65 (Ch. C105)

TUNER PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amplifier	6BC8	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6CL8	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	Setchell-Carlson PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	4					C10V4C				NPO
C202	1.8									
C203	1000			EF-001	MFT-1000				503C-D1	
C204	1000			EF-001	MFT-1000				503C-D1	
C205	9									
C206	.33									
C207	.39									
C208	1.3									
C209	47									
C210	1000			EF-001	MFT-1000				503C-D1	
C211	1.5									
C212	15			BPD-000015	DD-150	L10Q15	ED-15	UC-5415	5GA-Q15	
C213	1000			EF-001	MFT-1000				503C-D1	
C214	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1	
C215	1000			EF-001	MFT-1000				503C-D1	
C216	2					C10V2C				
C217	1.5									N220
C218	10			NPO-SI 10	TCZ-10	CTA6Q1C	TCO-10	ZT-541	5TCC-Q1	NPO
C219	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1	
C220	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1	
C221	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C222	100			EF-0001	MFT-100				503C-T1	
C223										

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Setchell-Carlson PART No.	NOTES
	OHMS	WATT		
R201	8200Ω			
R202	4.7meg			
R203	470K			
R204	10K			

ITEM No.	RATING		Setchell-Carlson PART No.	NOTES
	OHMS	WATT		
R205	220K			
R206	2200Ω			
R207	15K			
R208	4700Ω			

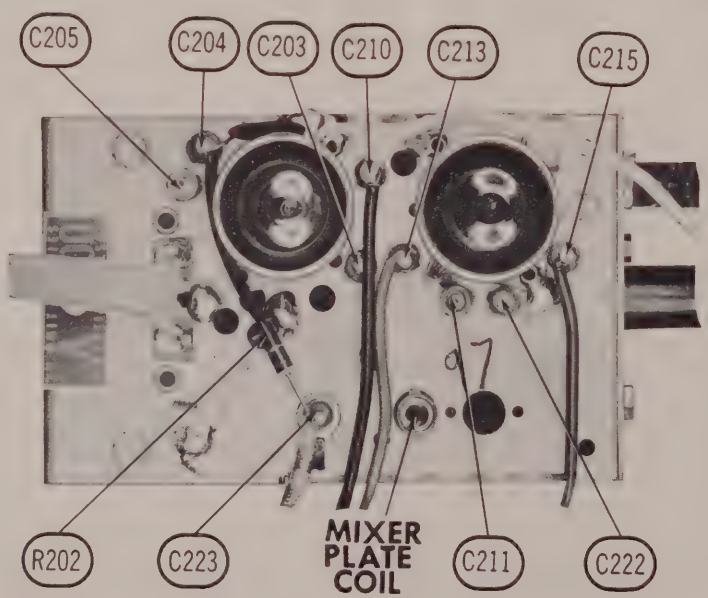
TUNER ALIGNMENT INSTRUCTIONS

OSCILLATOR ALIGNMENT

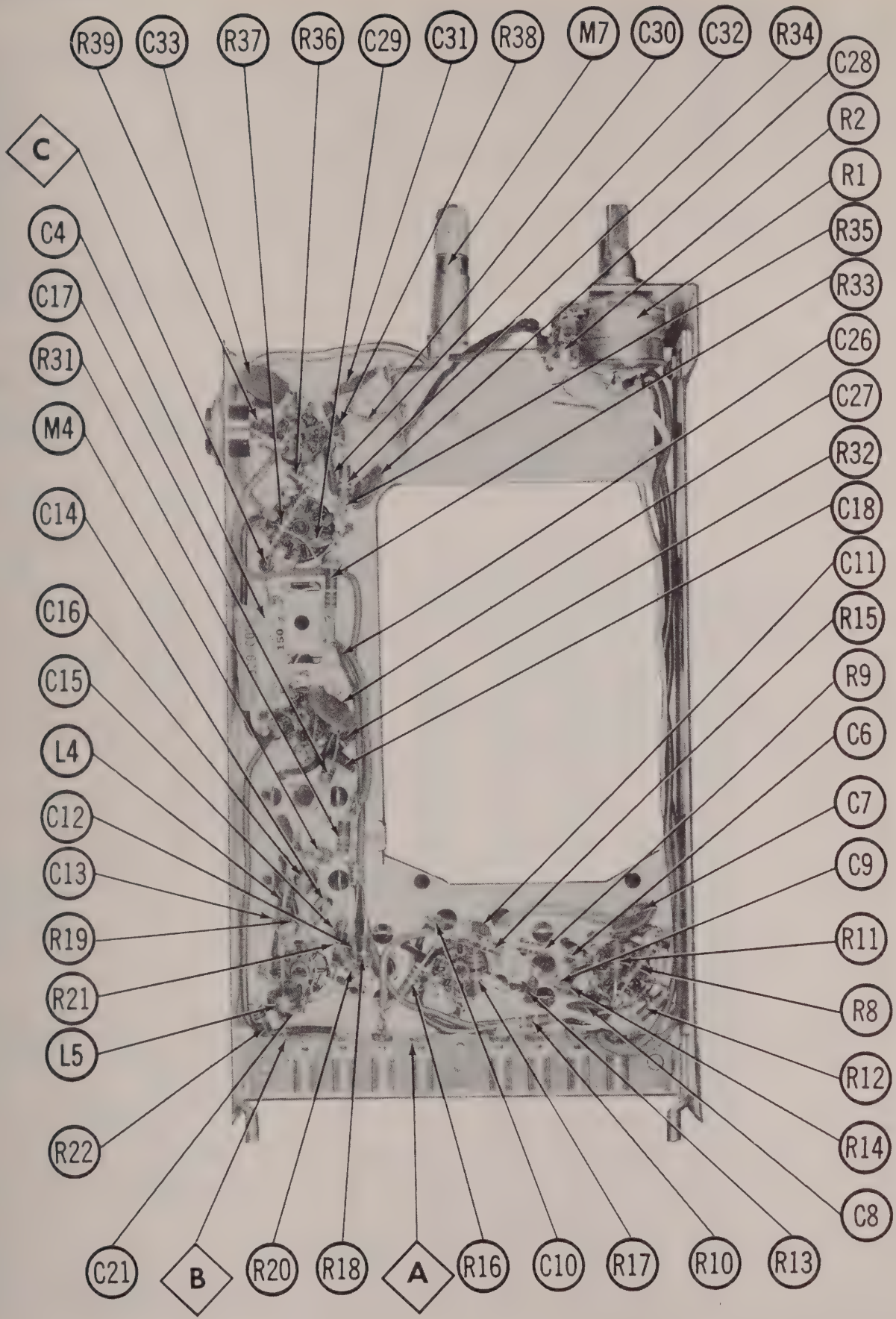
Set the fine tuning at the center of its range. One slug for HIGH band adjustment is located at 1 o'clock, and should be adjusted first. The LOW band adjustment is located at 6 o'clock. Adjust for best picture and sound.

RF AND MIXER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.



RF TUNER - TOP VIEW



VIDEO IF & SOUND SUB-CHASSIS

SET 432 FOLDER 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st Video IF Amp	6BZ6	
V2	2nd Video IF Amp	6BZ6	
V3	3rd Video IF Amp	6BZ6	
V4	Video Output-AGC Keying	6AW8A	
V5	Sound IF Amp	6BZ6	
V6	Ratio Det.-AF Amp.	6BN8	
V7	Audio Output	6AQ5A	
V8	Sync Sep	6C86	
V9	Vert. Mult.	12AU7A	
V10	Vert. Output	6CM6	
V11	Horiz. Mult.	12AU7A	
V12	Horiz. Output	6DQ6A	
V13	Damper	6AX4GT	
V14	HV Rect.	1G3GT	1B3GT*

* Alternate

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	Sethell-Carlson PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V15	17BJP4		17BJP4 ①	17BJP4 ②	① "Silverama" ③ ② "Silver Screen 86"

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT	Setchell-Carlson PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	200	200	①	PRI-075	BR200Z5	WS343		D-100	TVA-1480
C2A	140	350		AFB3-29-98	D0046				TVLS-3648 *
B	20	350			BRI0035				
C	140	350							
C3	5	150		SRE150V5	BBR4-150	TT150X5	TD-4-150	MT-1504	TVA-1403
C4	5	150		SRE150V5	BBR4-150	TT150X5	TD-4-150	MT-1504	TVA-1403
C5	100	50		PRS50V100	BRI005	TC350	TD-100-50	MTH-5010	TVA-1310

* Not normally in distributors sotck. Available thru distributor on order to manufacturer.
① Some versions may use a 100mfd ② 300VDC in this application.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	Setchell-Carlson PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	1000			BPD-01	DD-103	BYA10DlM	B-210	5HK-DI	
C7	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C8	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C9	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C10	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C11	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C12	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C13	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	①
C14	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C15	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C16	6.8			NPO-SI 6.8	TCZ-6R8	C10V68C	ZT-5568	5TCCB-V68S 10%*	10%
C17	8			NPO-SI 8				5TCCB-V8S8 5%*	5% ②
C18	68			1469-000056		22R5Q68		MB-456	10% ③
C19	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	CNO-522	5TCCB-V22S10%*	10% ③
C20	68			1469-000056		22R5Q68		MB-456	10%
C21	1000			BPD-001	DD-103	BYA10DlM	B-210	5HK-DI	
C22	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C23	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C24	270			1469-00027		5R5T27		MB-327	10%
C25	.047	600		P688N-047	DF-503	CUB6347	GEM-6147	6TM-S47	①
C26	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C27	30000			BPD-03	DF-303	BYB68S	GEM-613		
C28	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C29	1000			BPD-001	DD-103	BYA10DlM	B-210	5HK-DI	
C30	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C31	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C32	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C33	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C34	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C35	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C36	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C37	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C38	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C39	.0033	400		P488N-0033	D6-332	CUB6D33	GEM-6333	6TM-D33	
C40	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C41	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C42	.047	600		P688N-047	DF-503	CUB4847	GEM-6147	4TM-S47	
C43	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C44	100			1469-0001		22R5T1	MCB235	MB-31	10%
C45	100			1469-0001		22R5T1	MCB235	MB-31	10%
C46	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C47	3300			1464-0033		1R5D33		MS-333	10%
C48	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C49	680			1464-00068		1R5T68		MS-368	10%
C50	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C51	.0033	400					GEM-16333	6BF-D33	10%
C52	680			1464-00068		1R5T68		MS-368	10%
C53	100			1469-0001		22R5T1	MCB235	MB-31	10%
C54	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C55	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C56	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C57	75	4000						50GA-Q75S 10%*	10%
C58	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C59	1000			BPD-001	DD-102	BYA10DlM	B-210	5HK-DI	
C60	5000	1000		BPD-05	DD-502	BYA10D5	B-250	10HK-D5	
C61	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C62	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	
C63	10000			BPD-01	DD-103	BYA10SI	B-110	5HK-SI	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.
① Not used in some versions.
② Some versions may use 10mmf in this application.
③ Some versions may use 1.5mmf in this application.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Setchell-Carlson PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	2meg	½	808	B-76	A47-2meg-Z	Q13-139	U58	Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWS-13	76-1	UB-26	
R2	450Ω	½	809A	B-425		Q17-105	W52R	Contrast
R3A	3000Ω	½	801B	AB-8	A47-3000-S	B11-112	SU-8	Height(Top)
B	Shaft			AK-1	FKB-1/4	SK-3	Not Req.	
R4A	2.5meg	½	803	AB-83	A47-2.5meg -S	B11-239	SU565	Height (Bottom), Note 1
B	Shaft			AK-1	FKB-1/4	SK-3	Not Req.	
R5A	2.5meg	½	803	AB-83	A47-2.5meg -S	B11-239	SU565	Vert. Hold, Note 1
B	Shaft			AK-1	FKB-1/4	SK-3	Not Req.	
R6A	2.5meg	½	803	AB-83	A47-2.5meg -S	B11-239	SU565	Brightness, Note 1
B	Shaft			AK-1	FKB-1/4	SK-3	Not Req.	
R7A	2.5meg	½	803	AB-83	A47-2.5meg -S	B11-239	SU565	Horiz. Hold, Note 1
B	Shaft			AK-1	FKB-1/4	SK-3	Not Req.	

* Use KB with CRL "blue label" controls, and KR with "red label" controls.
Note 1. Some versions may use a 2meg control in this application.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Setchell-Carlson PART No.	NOTES
	OHMS	WATT		
R8	470Ω			
R9	180Ω			
R10	3900Ω			
R11	220K			
R12	820Ω			Note 1
R13	5200Ω			
R14	130K			Note 2
R15	100K			
R16	470Ω			
R17	82Ω			
R18	4700Ω			Note 3
R19	15K			Note 4
R20	470Ω			
R21	180Ω			
R22	4700Ω			
R23	2.2meg			
R24	47K			
R25	5600Ω	2		
R26	220K			
R27	4.7meg			
R28	470K			
R29	3900Ω			
R30	33K	1		
R31	180Ω			
R32	130Ω			Note 5
R33	180Ω			
R34	22K			
R35	4.7meg			
R36	470K			
R37	22K			
R38	1meg			
R39	330Ω	1		
R40	2.2meg			
R41	22K			
R42	22K			
R43	47K			
R44	47K	2		
R45	2.2meg			

ITEM No.	RATING		Setchell-Carlson PART No.	NOTES
	OHMS	WATT		
R46	2200Ω			
R47	6300Ω			
R48	220K			
R49	4700Ω			
R50	1meg			
R51	1meg			
R52	4.7meg			
R53	5600Ω			
R54	47K			
R55	470Ω			
R56	470Ω			
R57	470Ω			
R58	220K			
R59	100K			
R60	100K			
R61	470K			
R62	68K			
R63	27K	2		
R64	2.2meg			
R65	100K			
R66	15K			
R67	150K			
R68	12000Ω			
R69	8200Ω			
R70	1meg			
R71	82Ω			
R72	33K	2		Note 6
R73	33K	2		Note 6
R74	2.2Ω 5%			
R75	22Ω			
R76	3900Ω			
R77	20000Ω	7		
R78	300Ω	10		
R79	3Ω	5		
R80	3Ω	5		
R81	470Ω			
R82	5600Ω	2		

Note 1. Some versions may use 1200Ω in this application.
Note 2. Some versions may use 150K in this application.
Note 3. Some versions may use 8200Ω in this application.
Note 4. Not used in some versions.
Note 5. Some versions may use 82K in this application.
Note 6. Some versions may use 47K 2W in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		Setchell-Carlson PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	1st Video IF						
L2	2nd Video IF						
L3	3rd Video IF						
L4	RF Choke						12 Microhenries
L5	Series Peaking Coil		19-3250*	TV-185 *	6181 *	VP-6 *	225 Microhenries, wound on 2K resistor Note 1
L6	Series Peaking Coil		19-4400	TV-302	6196		400 Microhenries
L7A	47.25MC Trap						
B	Sound IF						
L8	Ratio Detector		17-3497	TV-116	6305	SD-4	
L9	Line Choke						

* Parallel with 25K resistor.
Note 1. Some versions may use 225 microhenries without parallel resistor.

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Setchell-Carlson PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ①	115V	7.6V ④ 5A tap ⑤ 6.3V ⑥ 7.8A	M1018A-RD						

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA						
		Setchell-Carlson PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Rogers PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Output		Z1900 ①	A-3038 ④	V307 ⑦		VO-100 ⑩	25S13	
T3	Yoke-Horiz. (20MH) (90°)-Vert. (38MH)		DF96T ③ ⑧	MDF-93 ④ ⑨	Y90F18/43 ⑨ ⑦	PCM3045 ⑪ ⑤	DY-16A ⑥ ⑩	Y-16 ⑨ ⑤	Y-41 & WW20 & YC-1 & CL-1
T4	Horiz. Output								

① Connect as autoformer, use 9 : 1 turns ratio, connect plate to terminal #1, connect yoke socket pin #1 to terminal #5, connect yoke socket pin #6 and screen to terminal #10.
② Connect as autoformer red to yellow, connect blue to plate, red and yellow to pin #6 of yoke socket and screen grid, green to pin #1 of yoke socket.
③ Connect blue to plate, red and yellow to screen grid, red to pin #6 of yoke socket, black to pin #10 of yoke socket.
④ Connect same as original. Requires new rear cover and centering device.
⑤ Use original yoke damping network, if necessary.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	Setchell-Carlson PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T5	6300Ω	3-4Ω	M1028	21113	A-2931	AU-602	A-3878	24S51	S-3X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Setchell-Carlson PART No.	QUAM PART No	
SP1	6"	PM	3-4Ω		6A1	

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	Setchell-Carlson PART No.	FEDERAL PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No	
M1	.200A		HF504 ①	1N1008 ②	SD-94A ①	M500 ①	① Silicon Type
M2	.200A		HF504 ①	1N1008 ②	SD-94A ①	M500 ③	② Germanium Type.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Setchell-Carlson PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
MS	3AG	2A 250V			312002. (3AG-2A-250V)	342012	AGC2	HKP-CC

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		Setchell-Carlson PART No.	CBS PART No.	SYLVANIA PART No	
M4	1N60		1N60	1N295	Video Det. (Pigtail)
M5	1N60		1N60	1N295	Horiz. AFC (Pigtail)
M6	1N60		1N60	1N295	Horiz. AFC (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	Setchell-Carlson PART No.	NOTES
M7	Lamp		#47
M8	Tuner	57-B-48	VHF

CABINETS & CABINET PARTS

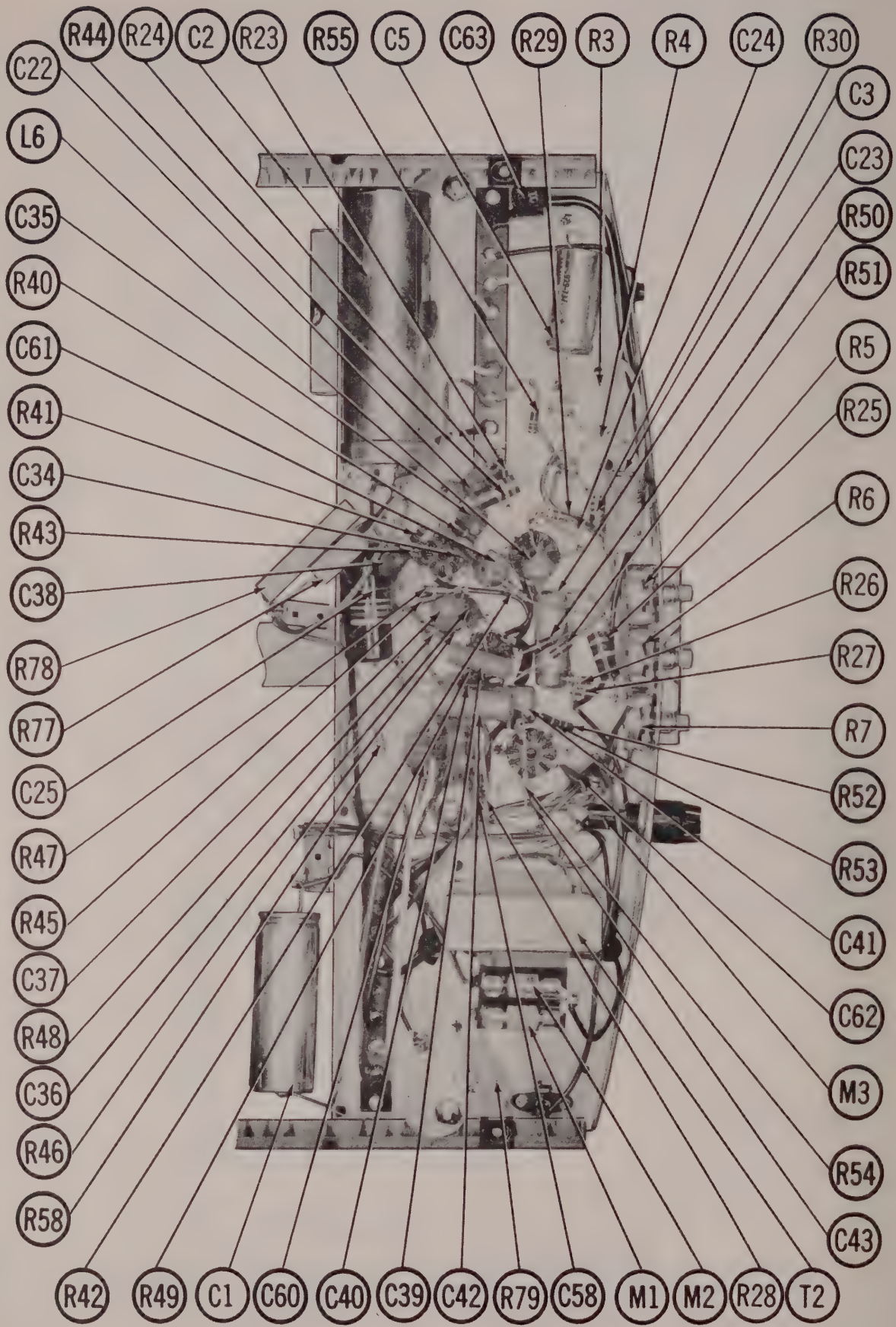
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

WIRING DATA

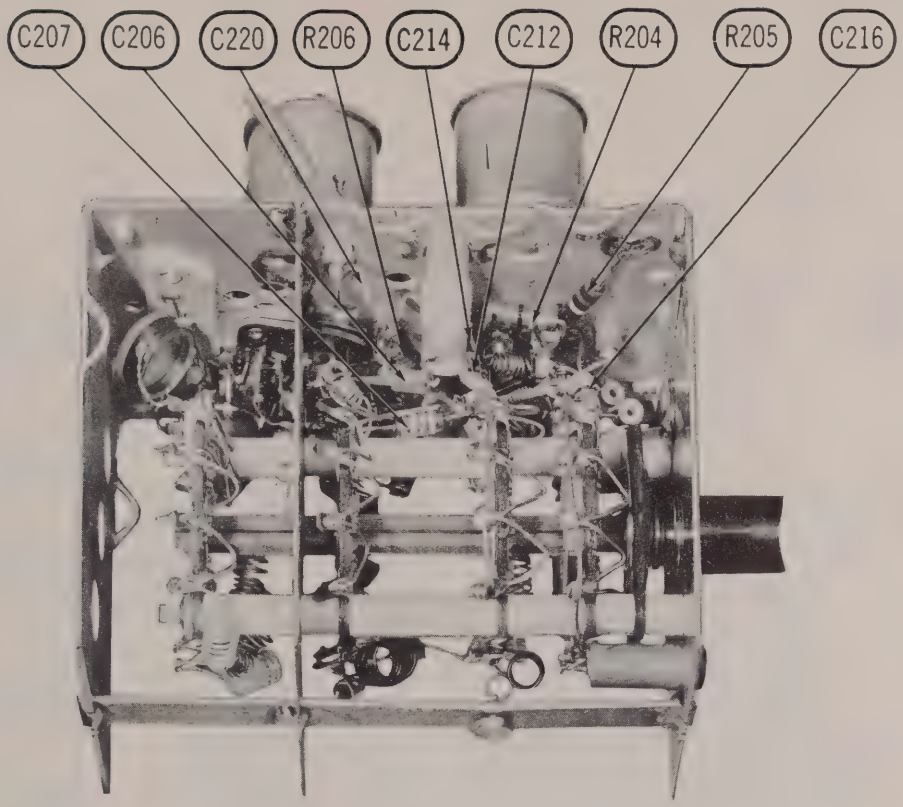
High Voltage Lead	Use BELDEN No. 8868
Shielded Hook-up Wire	Use BELDEN No. 8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8534 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No. 8874
300Ω Tuner Input Lead	Use BELDEN No. 8225
300Ω Antenna Lead-in	Use BELDEN No. 8230 or 8275
Antenna Rotor Cable	Use BELDEN No. 8464 (Flat) or 8484 (Round) - 4 Conductor 8495 (Round) - 5 Conductor 8488 (Round) - 8 Conductor

SETCHELL-CARLSON MODEL P65 (Ch. C105)

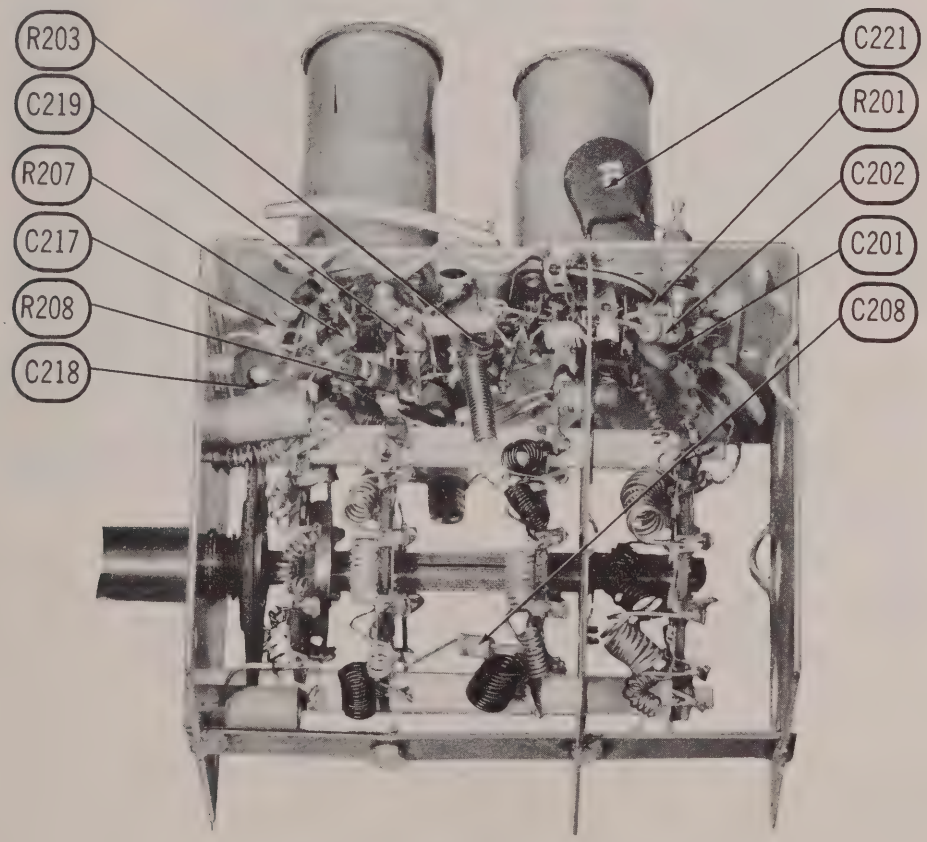
FOLDER 2



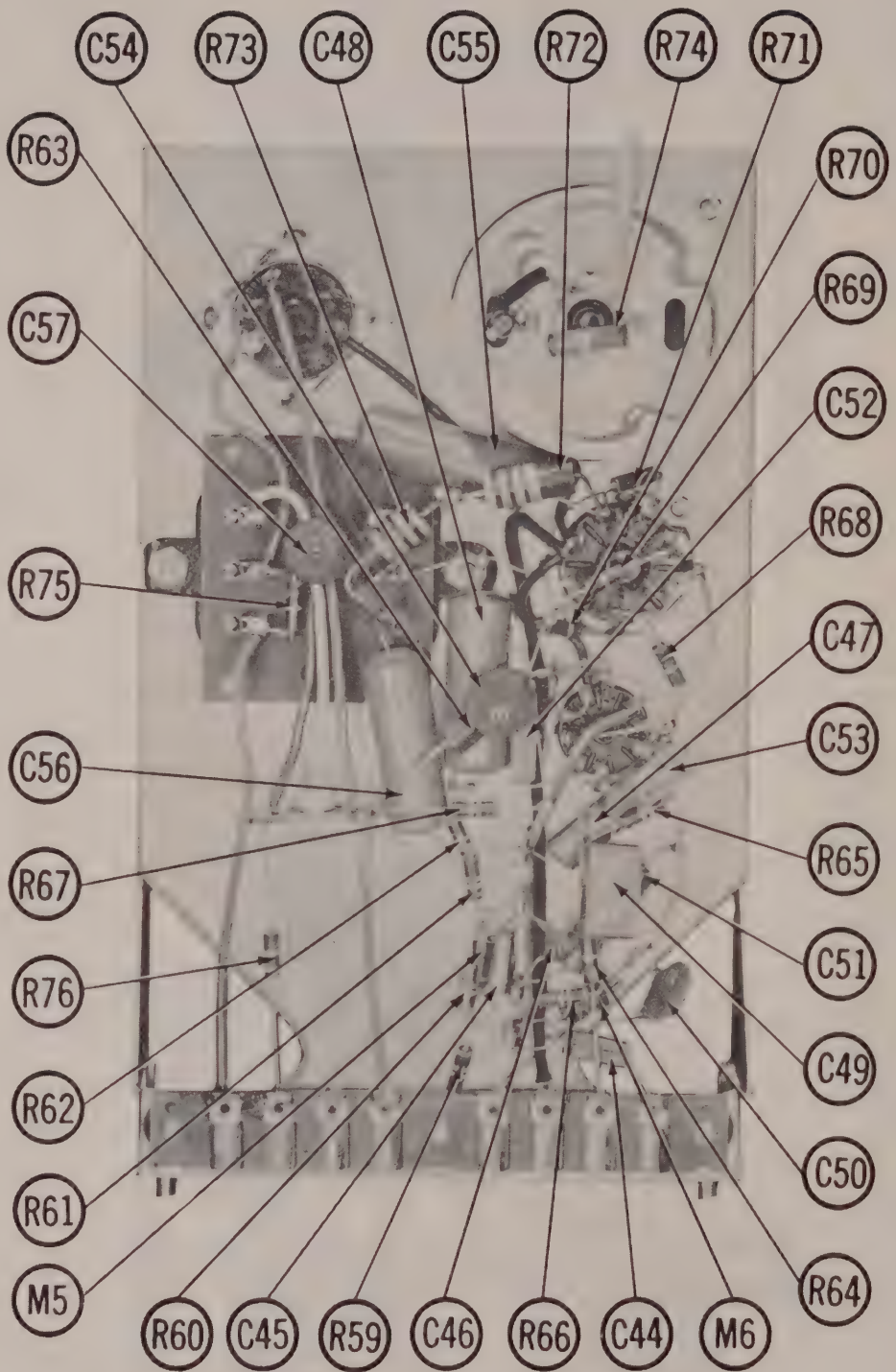
CHASSIS - BOTTOM VIEW



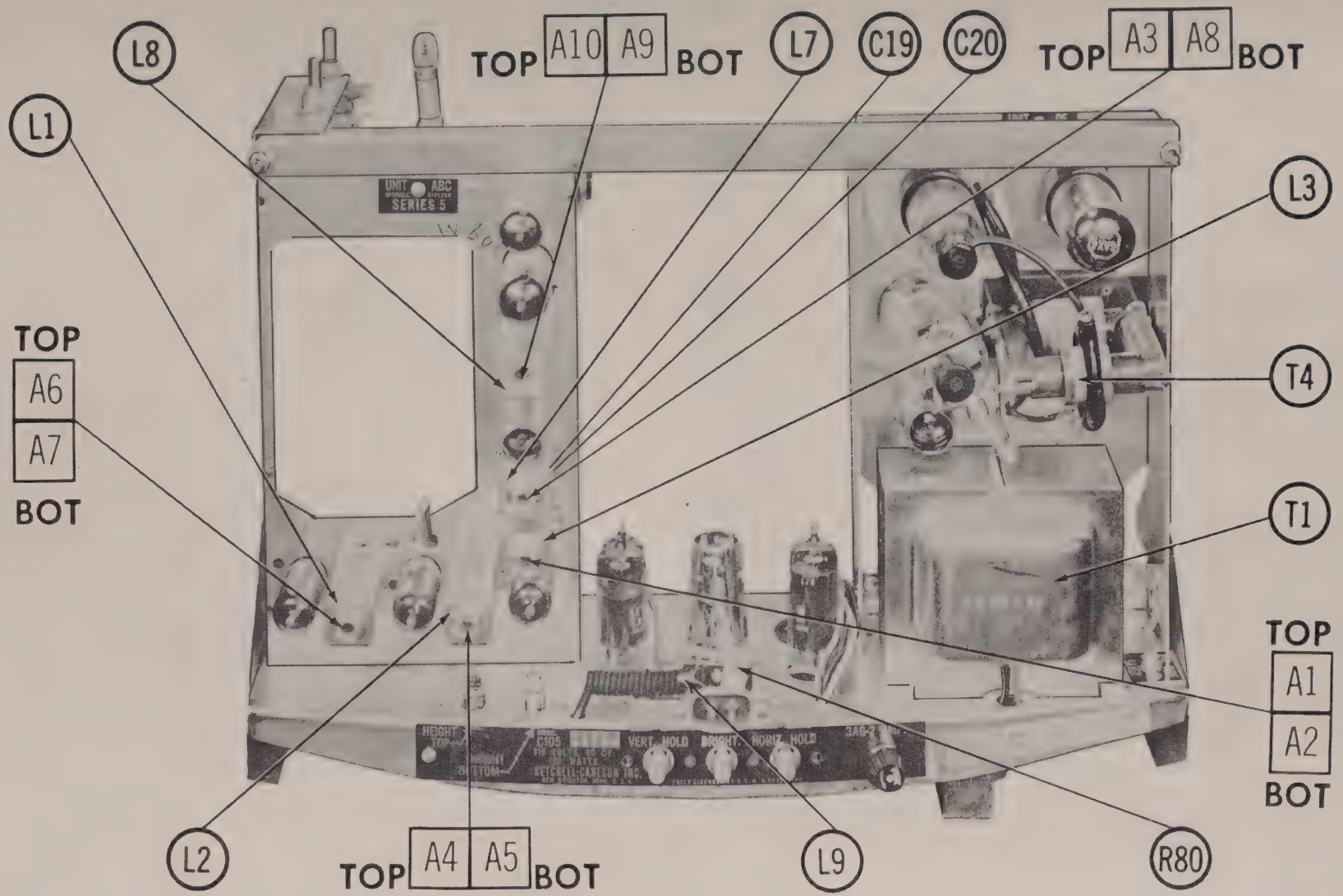
RF TUNER - LEFT SIDE



RF TUNER - RIGHT SIDE



HORIZONTAL SUB-CHASSIS



CHASSIS - REAR VIEW

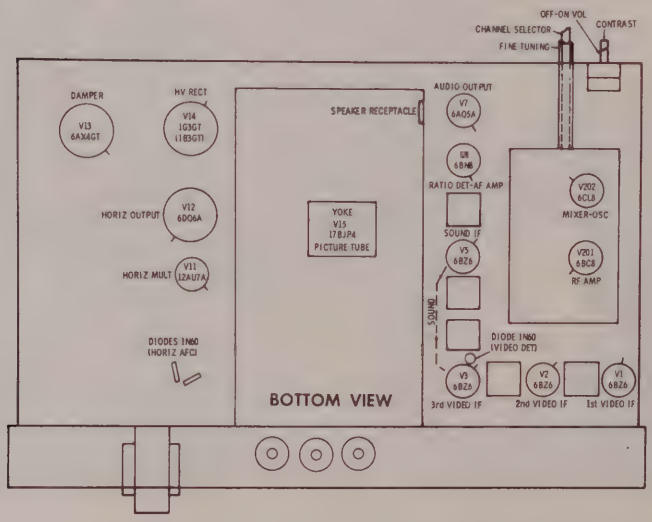
MODEL P65 (Ch. C105)

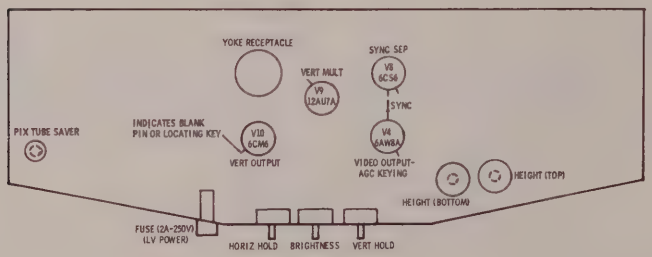
SETCHELL-CARLSON

RESISTANCE MEASUREMENTS

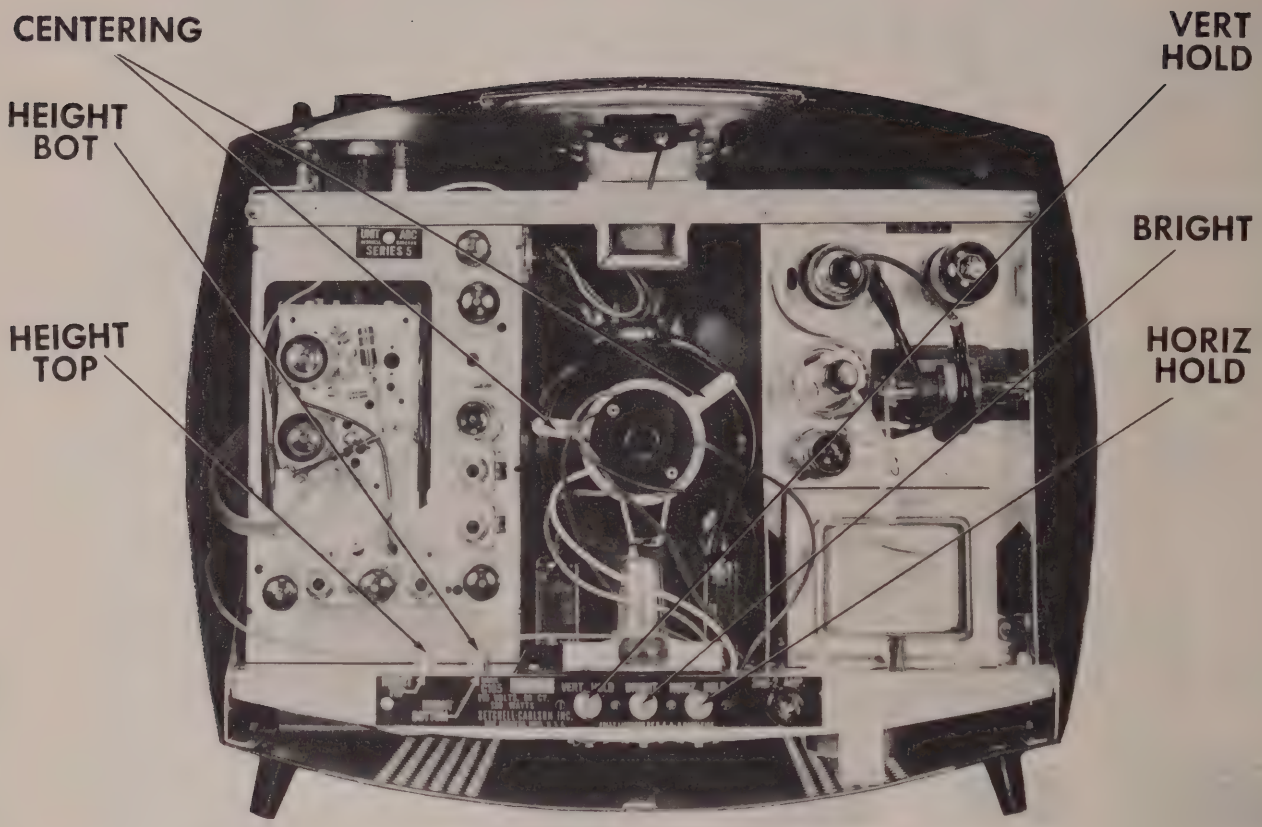
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BZ6	220K	820Ω	0Ω	.1Ω	▲180Ω	▲180Ω	820Ω		
V2	6BZ6	60K	▲82Ω	0Ω	.1Ω	†770Ω	†770Ω	INF		
V3	6BZ6	▲120Ω	▲0Ω	.1Ω	0Ω	†770Ω	†15K	INF		
V4	6AW8A	†33K	†37K	440K	.1Ω	0Ω	●90Ω	2.2meg	†37K	†5600Ω
V5	6BZ6	1.5Ω	120Ω	0Ω	.1Ω	▲300Ω	▲300Ω	120Ω		
V6	6BN8	INF	22K	INF	.1Ω	0Ω	0Ω	†470K	4.7meg	0Ω
V7	6AQ5A	1meg	330Ω	.1Ω	0Ω	†2400Ω	†2000Ω	1meg		
V8	6CS6	†2.2meg	0Ω	.1Ω	0Ω	†70K	†47K	2.2meg		
V9	12AU7A	†220K	2200Ω	4700Ω	.1Ω	.1Ω	● †2.2meg	●1.7meg	4700Ω	0Ω
V10	6CM6	†510Ω	NC	4.7meg	0Ω	.1Ω	4.7meg	●700Ω	NC	†860Ω
V11	12AU7A	†150K	100K	1200Ω	.1Ω	.1Ω	†27K	670K	1200Ω	0Ω
V12	6DQ6A	NC	.1Ω	TP	¶66K	1meg	NC	0Ω	0Ω	TOP CAP ¶10Ω
V13	6AX4GT	NC	NC	INF	NC	†300Ω	NC	0Ω	.1Ω	
V14	1G3GT	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP ¶230Ω
V15	17BJP4	.1Ω	●53K	Pin 6 †300Ω	Pin 10 ¶470K	Pin 11 ●1.3meg	Pin 12 3Ω			
V201	6BC8	†800Ω	INF	INF	.1Ω	0Ω	INF	2.4meg	0Ω	0Ω
V202	6CL8	15K	†11K	0Ω	.1Ω	0Ω	†8100Ω	†5900Ω	0Ω	230K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
● THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
▲ MEASURED FROM PIN 7 OF V2.
▲ MEASURED FROM PIN 7 OF V3.
† MEASURED FROM 235V SOURCE.
† MEASURED FROM PIN 3 OF V13.
NC NO CONNECTION.
TP TIE POINT.





TUBE PLACEMENT CHART



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station. Adjust the Horizontal Hold control until the picture synchronizes horizontally. If the control must be turned to either extreme to sync the picture, or if slow warm-up causes frequency drift, replace the Horizontal Multivibrator, 12AU7(V11) and readjust the Horizontal Hold control.

PHOTOFACT* Folder

ALTEC LANSING
MODEL 350A

ALTEC LANSING
MODEL 350A

MODEL 350A

TRADE NAME	Altec Lansing Model 350A		
MANUFACTURER	Altec Lansing Corp., 9356 Santa Monica Blvd., Beverly Hills, California		
TYPE SET	AC Operated Audio Amplifier		
TUBES	Six		
POWER SUPPLY	110-120 Volts AC, 60 Cycles	RATING	180 Watts, 1.82 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. - Phase Inv.	12AY7	
V2	Driver	12AU7	
V3	Output	6550	

ITEM No.	USE	TYPE	NOTES
V4	Output	6550	
V5	Voltage Regulator	0A3/VR75	
V6	Rectifier	5U4GB	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Altec Lansing PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	500		AFH2-72	B0530	FP288	TMD-62	D-265	TVL-2940
B	▲40	500							
C2A	▲40	500		AFH2-72	B0530	FP288	TMD-62	D-265	TVL-2940
B	▲40	500							
C3	50	3		SRE3V50	BBR50-3	TT6X50	TD-50-6	MMT-350	TVA-1100
C4	100	50		PRS50V100	BR1005	TC3501	TD-100-50	MTH-5010	TVA-1310

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	Altec Lansing PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	.05	200		P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C6	39			DI-000039	DD-390	L10Q39	UC-5439	5GA-Q39	
C7	.5	400		P488N-5		CUB4P5	GEM-405	4TM-P5	
C8	47			DI-000047	DD-470	L10Q47	UC-5447	5GA-Q47	
C9	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C10	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C11	.22	400		P488N-22		CUB4P22	GEM-4022	4TM-P22	
C12	500			DI-0005	DD-501	L10T5	UC-535	5GA-T5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Altec Lansing PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	200K	½	12761	B-51	A47-250K-Z	Q13-130	U44	Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R2A	500Ω	2(WW)	12762	WW-501 †	A43-500	WPK500	R500L	Damping
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

† Saw off shaft and file flat as needed to fit knob.

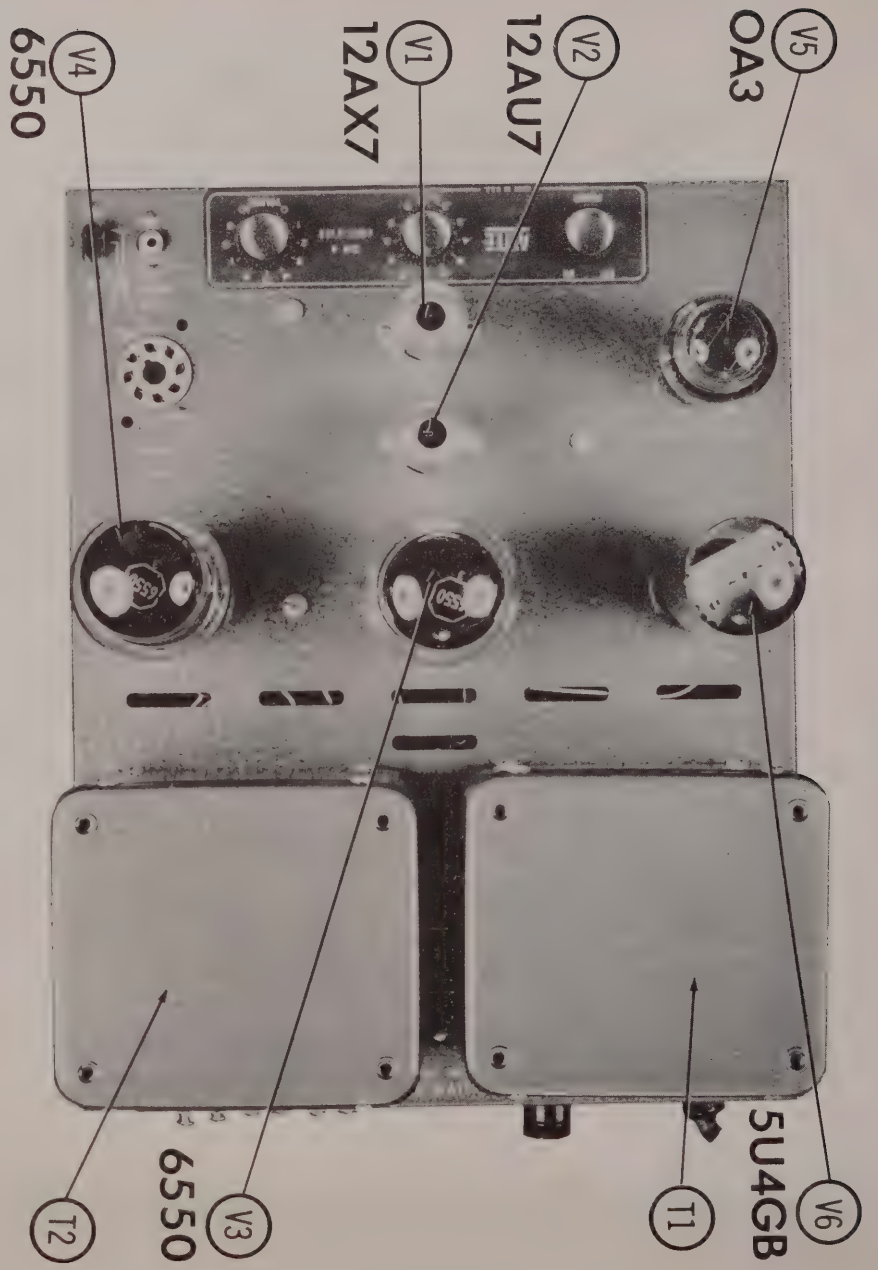
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Altec Lansing PART No.	NOTES
	OHMS	WATT		
R3	1000Ω			
R4	47Ω 1%			
R5	240K	1		
R6	47K	1		
R7	68K 1%			
R8	68K 1%			
R9	1meg			
R10	47K 1%	1		
R11	18K	1		
R12	100K			
R13	47K 1%	1		
R14	47K	1		
R15	100K			
R16	100K			

ITEM No.	RATING		Altec Lansing PART No.	NOTES
	OHMS	WATT		
R17	175Ω	20		
R18	1800Ω			
R19	.51Ω	1		
R20	.51Ω	1		
R21	.51Ω	1		
R22	.24Ω	1		
R23	.24Ω	1		
R24	.24Ω	1		
R25	47Ω 1%			
R26	100Ω			
R27	47K	1		
R28	10K	2		
R29	47Ω	1		

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
				Altec Lansing PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
	PRI.	SEC. 1	SEC. 2							
T1	117V @ 1.9A	780VCT @ .200A	5V @ 3A	6142		P-3155 ①				
	SEC. 3	SEC. 4	SEC. 5							
	6.3VCT @ 4A									

① Drill new mounting holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
			Altec Lansing PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
	PRI.	SEC.								
T2	5000Ω CT	125Ω (70V) Taps @ 16Ω, 8Ω	16473							

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Altec Lansing PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	3A 250V			312003. (3AG 3A 250V)	342001	AGC3	HKP

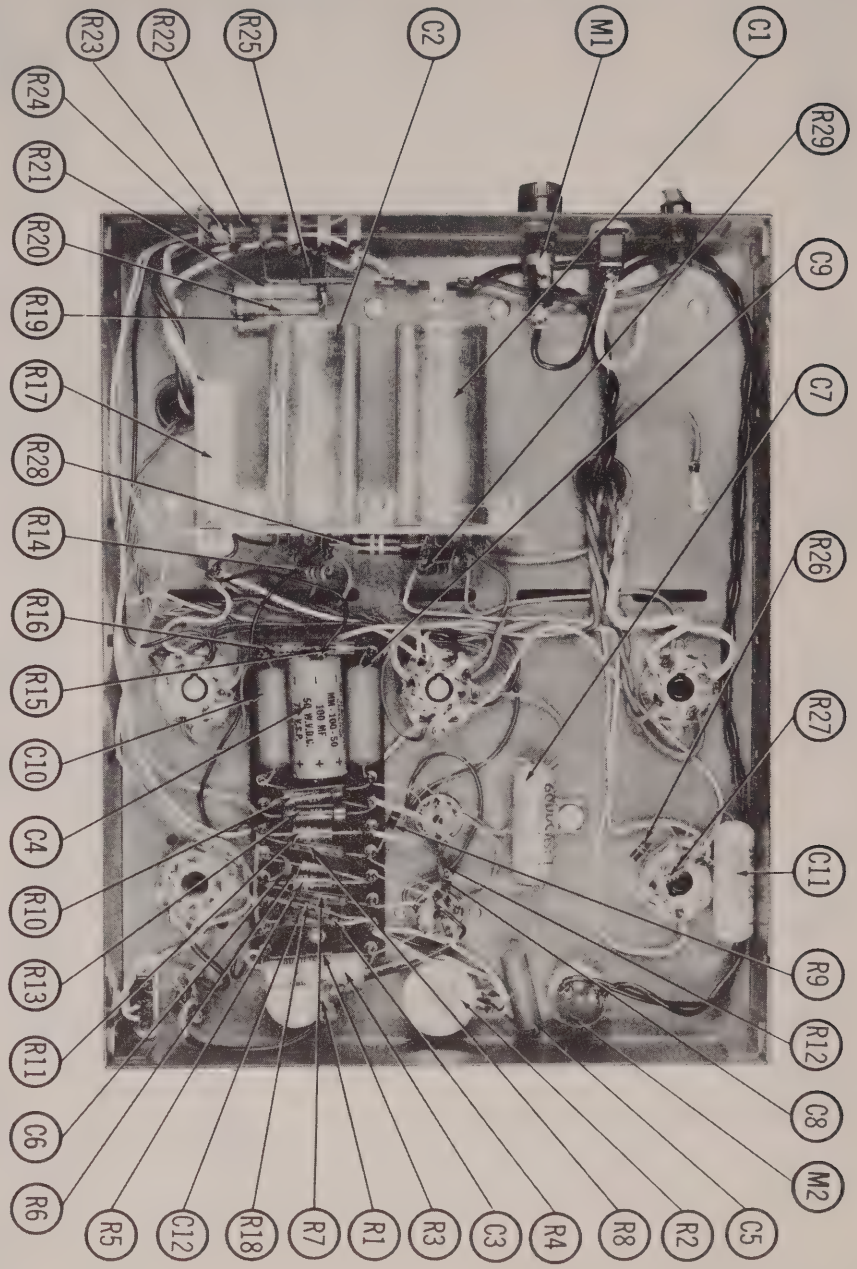
MISCELLANEOUS

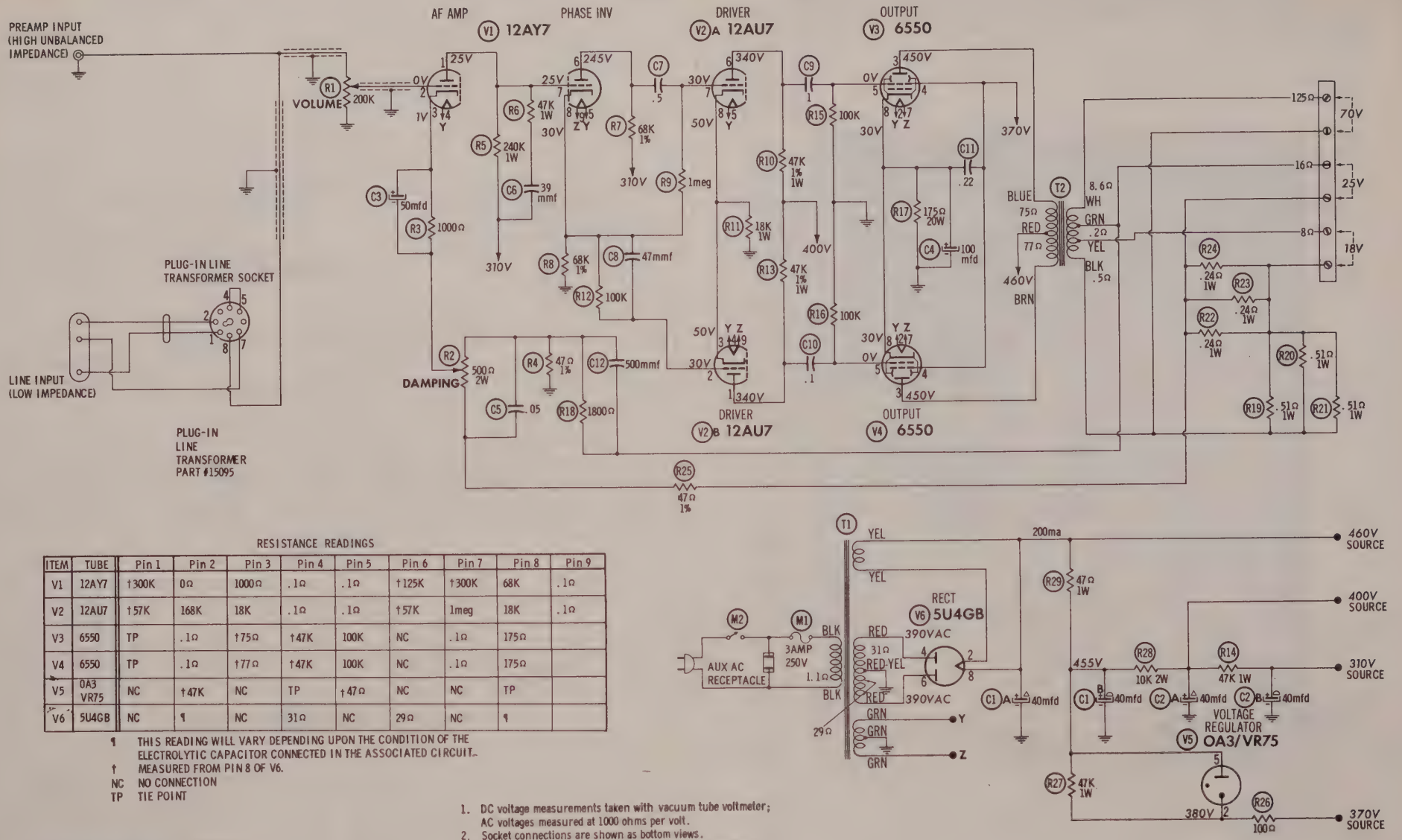
ITEM No.	PART NAME	Altec Lansing PART No.	NOTES
M2	Switch	12763	Power Off-On (SPST, Rotary, Snap Action Type)

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)

CHASSIS—BOTTOM VIEW





RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AY7	†300K	0Ω	1000Ω	.1Ω	.1Ω	†125K	†300K	68K	.1Ω
V2	12AU7	†57K	168K	18K	.1Ω	.1Ω	†57K	1meg	18K	.1Ω
V3	6550	TP	.1Ω	†75Ω	†47K	100K	NC	.1Ω	175Ω	
V4	6550	TP	.1Ω	†77Ω	†47K	100K	NC	.1Ω	175Ω	
V5	0A3 VR75	NC	†47K	NC	TP	†47Ω	NC	NC	TP	
V6	5U4GB	NC	¶	NC	31Ω	NC	29Ω	NC	¶	

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 8 OF V6.
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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ALTEC LANSING MODEL 350A

PHOTOFACT* Folder with CIRCUITRACE

ARVIN MODELS 8581, 8583 (Ch. 1.43700, 1.43900)

ARVIN MODELS 8581,
8583 (Ch. 1.43700, 1.43900)

MODEL 8581

ARVIN MODELS 8581,
8583 (Ch. 1.43700, 1.43900)

TRADE NAME	Arvin Models 8581, 8583 (Ch. 1.43700, 1.43900)
MANUFACTURER	Arvin Industries, Inc., Columbus, Indiana
TYPE SET	Three Power Portable AM Receiver
TUBES	Four
POWER SUPPLY	110-120 Volts AC-DC (or) 7.5 Volts DC "A" Supply & 90 Volts DC "B" Supply
RATING	9 Watts, .14 Amp. @ 117 Volts AC (or) 60MA @ 7.5 Volts DC & 14MA @ 90Volts DC
TUNING RANGE—BROADCAST	535 - 1650KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use battery power, if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1mfd capacitor in series with low side of the signal generator and B-.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Suggested Alignment Tools: A1, A2, A3, A6.....General Cement #8606, 8606L, 8282, 9295
Walsco #2526, 2543, 2544, 2545
A4, A5.....General Cement #5000, 5003, 5014, 5015, 5016, 8276, 8290
Walsco #2512, 2515, 2522, 2523, 2525, 2537

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.		Loop	455KC (400~ Mod.)	Tuning Gang fully open	Across voice coil	A1, A2, A3	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
2.		"	1670KC	"	"	A4, A5	"
3.		"	600KC	"	"	A6	Adjust for maximum output. Repeat steps 2 and 3.
4.		"	1000KC	Tune to 1000KC signal	"		Adjust for maximum output by bending second set of segments of antenna rotor of tuning gang.
5.		"	600KC	Tune to 600KC signal	"		Adjust for maximum output by bending third set of segments of antenna rotor of tuning gang.

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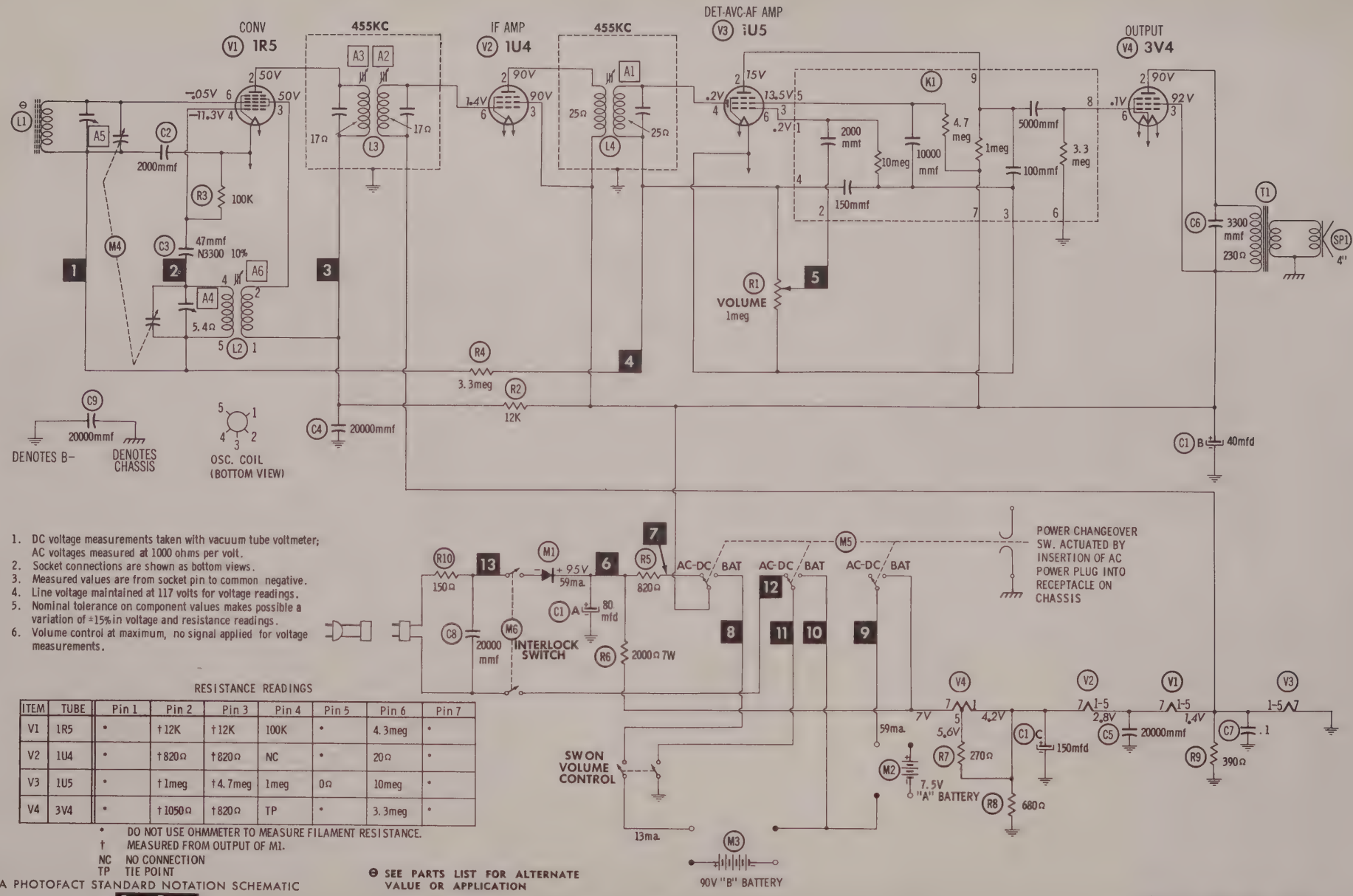
H861

SET 432 FOLDER 4



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	1R5	•	†12K	†12K	100K	•	4.3meg	•
V2	1U4	•	†820Ω	†820Ω	NC	•	20Ω	•
V3	1U5	•	†1meg	†4.7meg	1meg	0Ω	10meg	•
V4	3V4	•	†1050Ω	†820Ω	TP	•	3.3meg	•

• DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
† MEASURED FROM OUTPUT OF M1.
NC NO CONNECTION
TP TIE POINT

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE

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ARVIN MODELS 8581, 8583 (Ch. 1.43700, 1.43900)

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	1R5	
V2	IF Amplifier	1U4	
V3	Det. - AVC - AF Amp.	1U5	
V4	Output	3V4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA ARVIN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	80	150	44328-3						R2732 *
B	40	150							
C	150	10							

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA ARVIN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C3	47								N3300 10%
C4	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C5	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C6	3300			BPD-0033	DD-332	BYA10D33	B-233	5HK-D33	
C7	.1	50		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C8	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C9	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA ARVIN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	1meg	½	45250-2					Volume & Switch

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	ARVIN PART No.	NOTES
R2	12K			
R3	100K			
R4	3.3meg			
R5	820Ω			
R6	20000Ω	7	44448-4	
R7	270Ω			
R8	680Ω			
R9	390Ω			
R10	150Ω		44814	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA ARVIN PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loopstick	45304-29 ①					Includes Handle Ass'y.
L2	Osc. Coil	43644-4					
L3	Input IF	44282-2					
L4	Output IF	45430-1					

① Refer to Handle Assembly under Cabinet Parts.

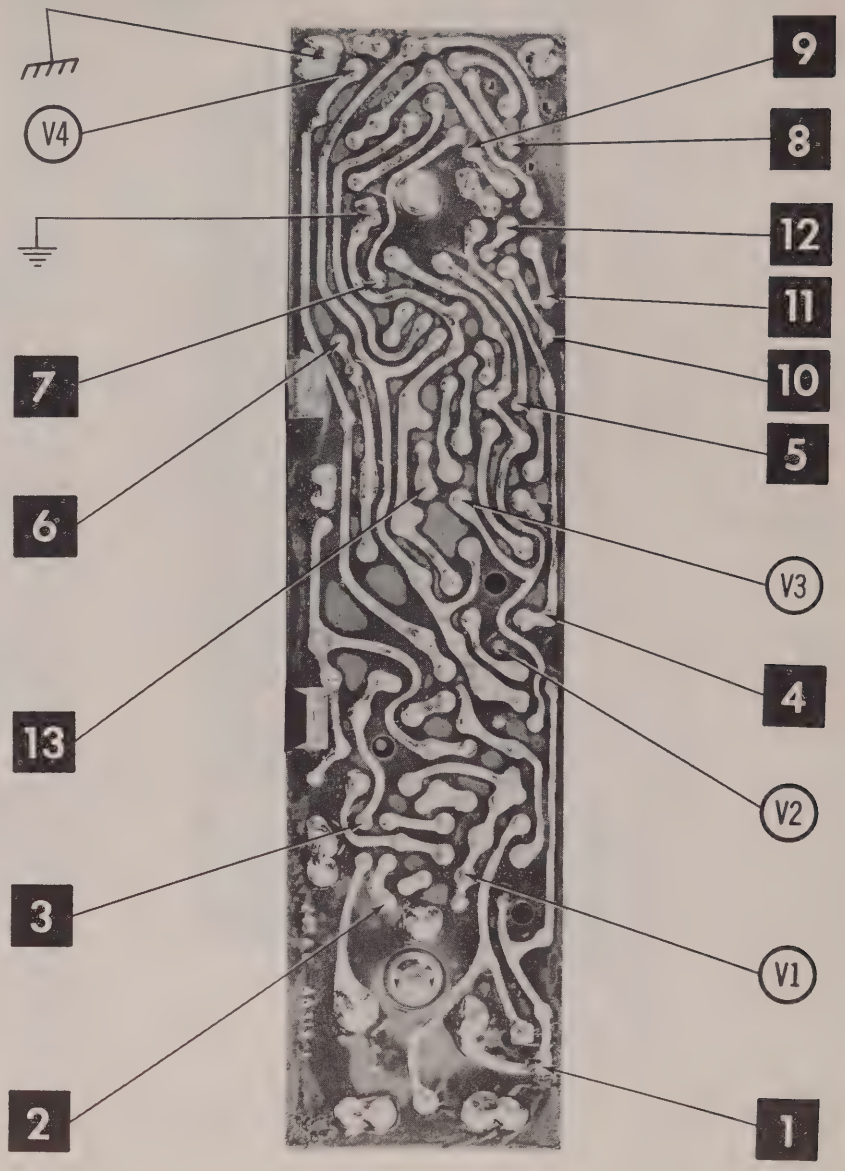
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA ARVIN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	7700Ω	3-4Ω	42026-5	Z1110	A-2927 ①		A-3329	24S49	S-8X	① Drill new mounting hole.

PRINTED BOARD

A Howard W. Sams CIRCUITRACE* Photo

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	ARVIN PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	45600-2	4A07	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	ARVIN PART No.	REPLACEMENT DATA
K1	Audio Circuit	100mmf, 150mmf, 2000mmf, 5000mmf, 10000mmf, 1meg, 3.3meg, 4.7meg, 10meg	43743-6	Aerovox PA-136-3 Centralab PC-160, PC-165 Sprague DP-1

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	ARVIN PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.059A	44465-4	1234AH	T065 SD-94 ①	65A K200 ①	① Silicon Type

BATTERIES

ITEM No.	VOLTAGE	ARVIN PART No.	REPLACEMENT DATA						NOTES
			BURGESS		EVEREADY		MALLORY		
			"A"	"B"	"A"	"B"	"A"	"B"	
M2 M3	7.5V 90V		D5	P60	707	479	M26	M214	

MISCELLANEOUS

ITEM No.	PART NAME	ARVIN PART No.	NOTES
M4	Tuning Cap.	45428-1	2 Gang, Ant. 24-330mmf, Osc. 34-149mmf
M5	Switch	44450	AC-DC-Battery (Slide, Spring Return Type)
M6	Switch	45421-1	Interlock Bracket Assembly
	Printed Board	45319-1	

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

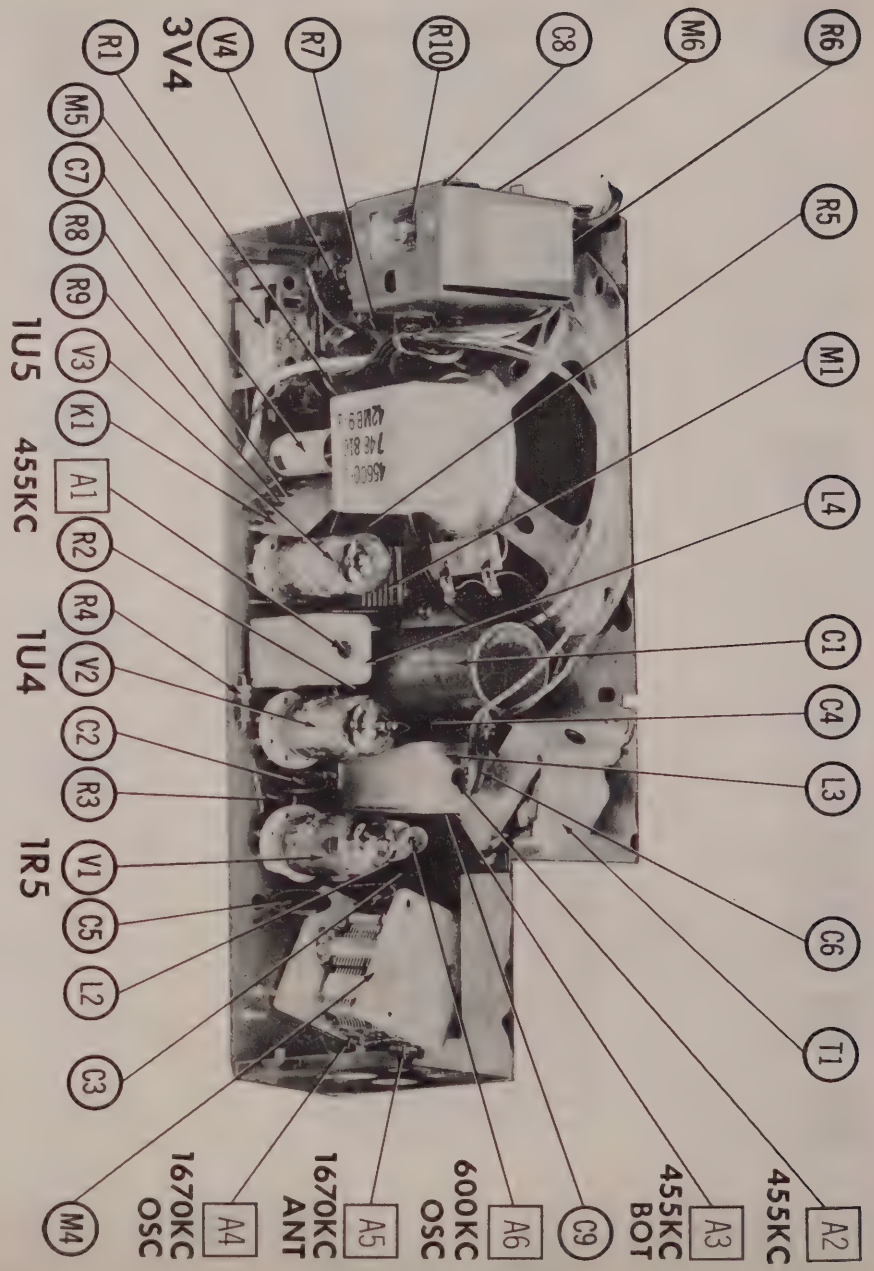
NAME	PART NO.	DESCRIPTION
Knob	45257-29	Tuning, Model 8581
Knob	45258-29	Off-On-Volume, Model 8581
Knob	45257-89	Tuning, Gray, Model 8583
Knob	45257-67	Tuning, White, Model 8583
Knob	45258-89	Off-On-Volume, Gray, Model 8583
Knob	45258-67	Off-On-Volume, White, Model 8583
Cabinet Assembly	45608-79	Model 8581
Cabinet Assembly	45608-77	Less Handle, White, Model 8583
Cabinet Assembly	45608-75	Less Handle, Turquoise, Model 8583
Handle Assembly	45304-29	Includes L1, Model 8581
Handle Assembly	45478-89	Includes L1, Gray, Model 8583
Handle Assembly	45478-75	Includes L1, Turquoise, Model 8583

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

CHASSIS—TOP VIEW

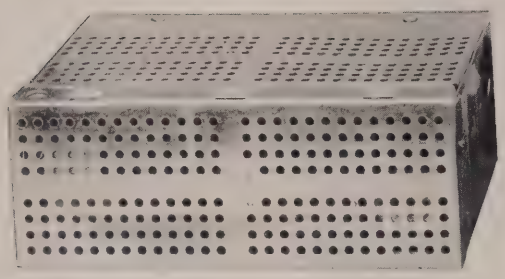


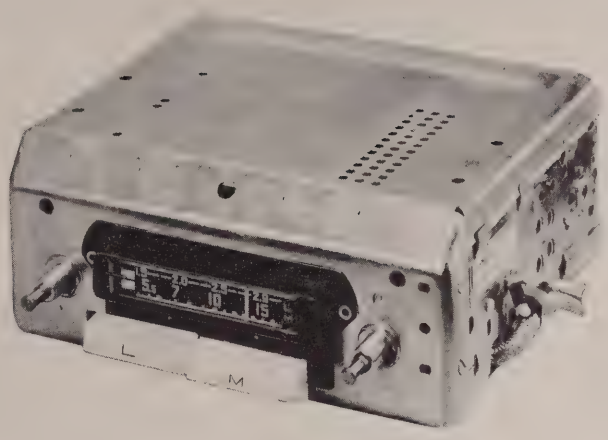
PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

BLAUPUNKT
MODEL "Bremen"

BLAUPUNKT
MODEL "Bremen"





TRADE NAME	Blaupunkt Model BREMEN (Above Serial #GI40001)
IMPORTER	Robert Bosch Corp., 40-25 Crescent St., Long Island City 1, N. Y.
TYPE SET	Battery Operated BC-LW Automobile Receiver
TUBES	Four
POWER SUPPLY	6 Volt (Or) 12 Volt Storage Battery — RATING 4.8 Amp@6.3Volts DC (Or) 2.4Amp@12.6 Volts DC
TUNING RANGE—BROADCAST	520-1650KC — LONG WAVE 140KC-300KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:

A1, A2, A3, A4..... General Cement #5009, 8195, 8274, 8275, 8728, 8987
Walsco #2531

A5..... General Cement #9050L, 9150
Walsco #2521

A6, A7..... General Cement #8721, 8722
Walsco #2519

A9..... General Cement #5004, 5008, 5009
Walsco #2520

A10, A11..... General Cement #9050L, 9150
Walsco #2521

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	Fig 1	Thru dummy antenna to Pin 2 of ECH81(V1)	460KC (400~ Mod.)	M	High end stop	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	"	"	"	"	"	"	A5	Adjust for MINIMUM output.
3.	"	"	1100KC	"	1100KC	"	A6, A7	Adjust for maximum output.
4.	"	"	520KC	"	520KC	"	A8, A9	"
5.	"	"	250KC	L	250KC	"	A10, A11	"

With radio installed in car and antenna fully extended, tune in a weak station near 1400KC and adjust A9 for maximum output.

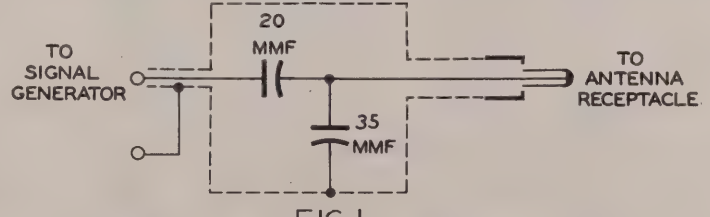


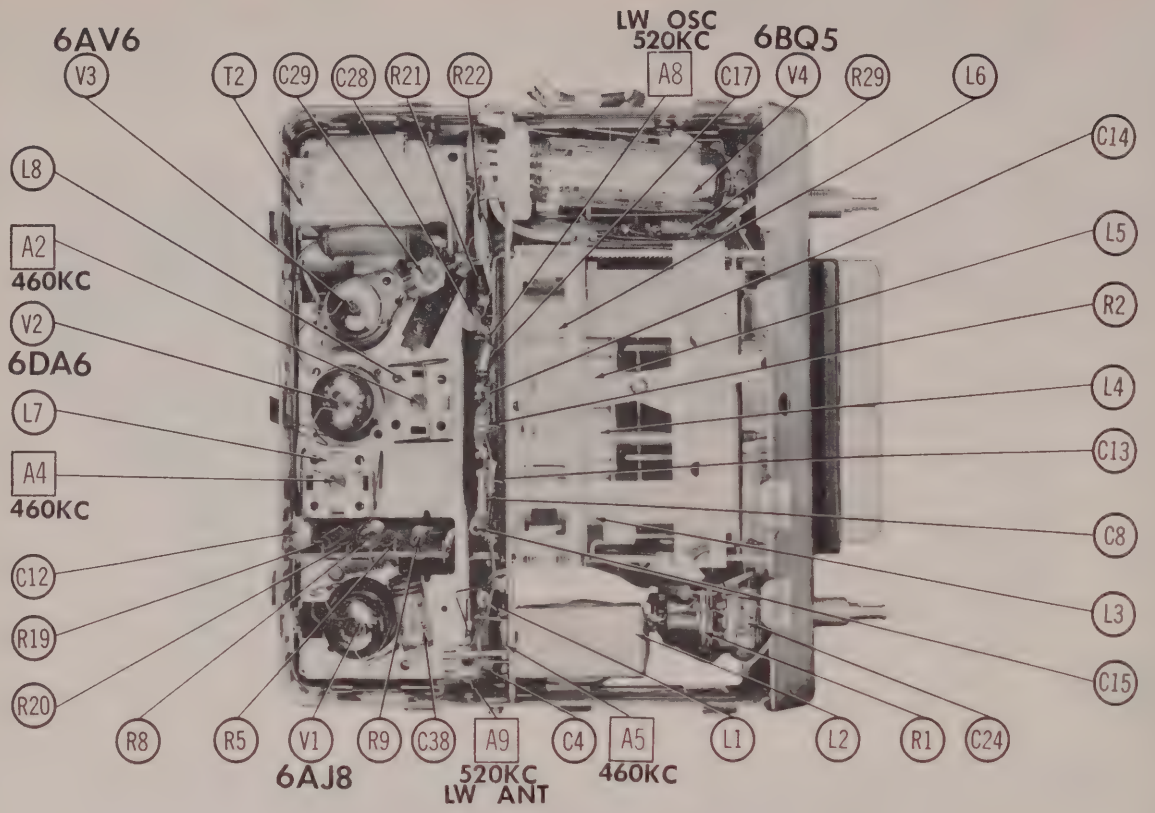
FIG. 1

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

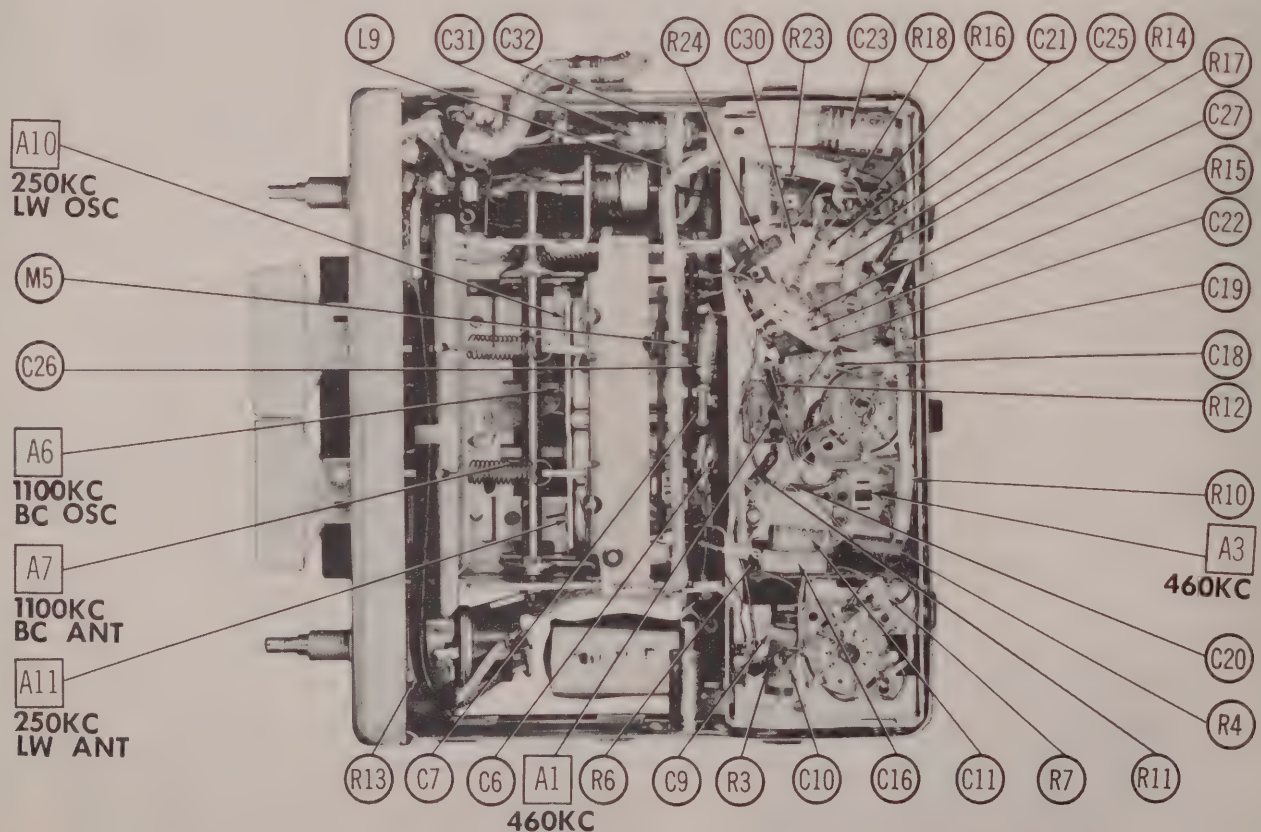
The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

H885

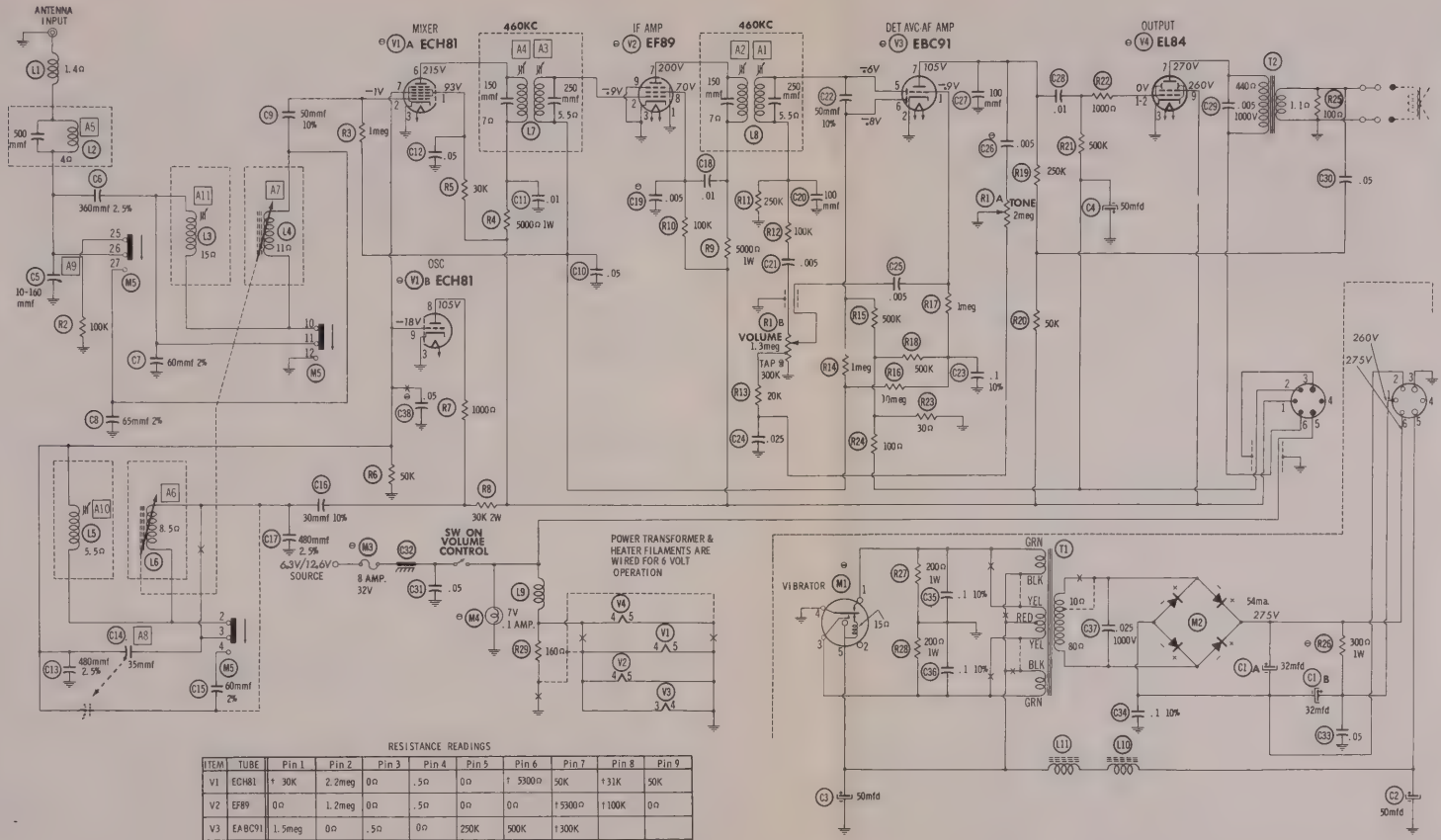
SET 432 FOLDER 5



CHASSIS-TOP VIEW



CHASSIS-BOTTOM VIEW



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	ECH81	† 30K	2.2meg	0Ω	.5Ω	0Ω	† 5300Ω	50K	†31K	50K
V2	EF89	0Ω	1.2meg	0Ω	.5Ω	0Ω	0Ω	†5300Ω	†100K	0Ω
V3	EABC91	1.5meg	0Ω	.5Ω	0Ω	250K	500K	†300K		
V4	EL84	500K	500K	0Ω	.5Ω	0Ω	NC	†440Ω	NC	†300Ω

† MEASURED FROM OUTPUT OF M1.
NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 6.3 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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BLAUPUNKT
MODEL "Bremen"

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Mixer-Osc.	ECH81/6AJ8 ①
V2	IF Amplifier	EF89/6DA6 ①
V3	Det.-AVC-AF Amp.	EBC91/6AV6 ①
V4	Output	EL84/6BQ5 ①

① Domestic type listed may not be directly interchangeable in some instances.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	BLAUPUNKT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	32	385	K0761/24x						R2600 *
B	32	385							
C2	50	18	K0742/9n	PRS25V50	BBR50-25	TC29	TD-50-25	MT-0250	TVA-1206
C3	50	18	K0742/9n	PRS25V50	BBR50-25	TC29	TD-50-25	MT-0250	TVA-1206
C4	50	15							

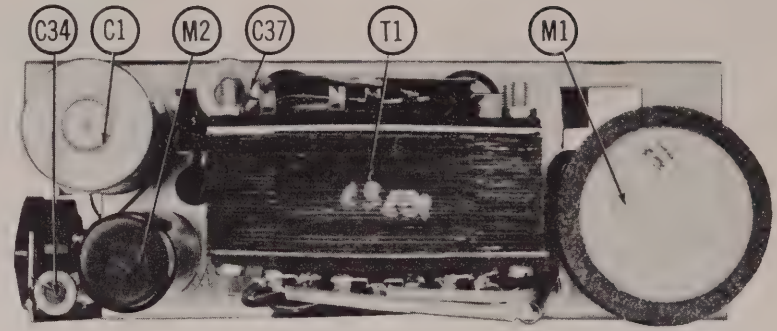
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

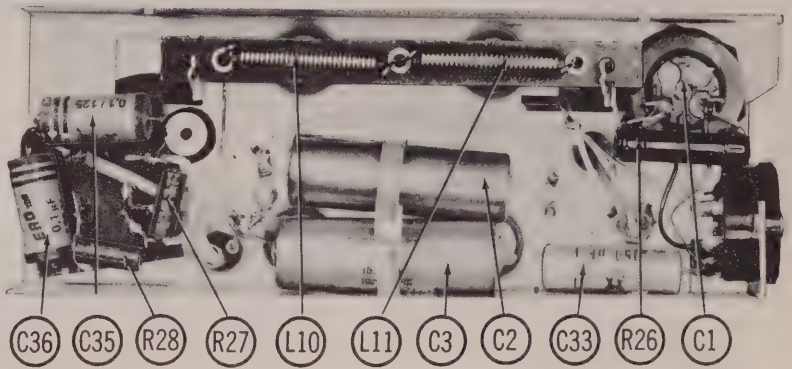
FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	BLAUPUNKT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	10-60		TK6/15x						
C6	360		KO809/71n						2.5%
C7	60		KO842/71n						2%
C8	65		KO842/73n						2%
C9	50		KO845/51n		D6-500				10%
C10	.05	250	KO788/66n	P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C11	.01	500	KO792/41n	P488N-01	D6-103	CUB6S1	GEM-611	6TM-S1	
C12	.05	500	KO792/48n	P688N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C13	480		KO809/72n						2.5%
C14	35		KO101/7z						
C15	60		KO842/71n						2%
C16	30		KO843/50n	NPO-SI30	TCZ-30	CTA6Q3C			10%
C17	480		KO809/72n						2.5%
C18	.01	500	KO792/41n	P688N-01	D6-103	CUB6S1	GEM-611	6TM-S1	
C19	.005	500	KO792/67n	P688N-005	D6-502	CUB6D5	GEM-625	6TM-D5	
C20	100			SI-100	D6-101	LT6T1	UC-531	5GA-T1	①
C21	.005	500	KO792/67n	P688N-005	D6-502	CUB6D5	GEM-625	6TM-D5	
C22	50		KO845/51n	NPO-SI 50	D6-500	CTA6Q51C	ZT-545	5TCC-Q5	10%
C23	.1	125	KO788/69n				GEM-201	2WF-P10	10%
C24	.025	250	KO788/65n	P488N-025			GEM-4125	4TM-S25	
C25	.005	500	KO792/67n	P488N-005	D6-502	CUB6D5	GEM-625	6TM-D5	
C26	.005	500	KO792/67n	P488N-005	D6-502	CUB6D5	GEM-625	6TM-D5	
C27	100			SI 100	D6-101	LT6T1	UC-531	5GA-T1	①

POWER CHASSIS





PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	BLAUPUNKT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C28	.01	500	KO792/41n	P488N-01	D6-103	CUB6S1	GEM-611	6TM-S1	
C29	.005	1000	KO778/66n	P1088N-005	DD16-502	CUB10D5	GEM-1025	10TM-D5	
C30	.05	500	KO792/48n	P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	
C31	.05	250	KO788/66n	P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C32									
C33	.05	350	KO784/48n	P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C34	.1	125	KO770/65n				GEM-201	2WF-P10	10%
C35	.1	125	KO788/69n				GEM-201	2WF-P10	10%
C36	.1	125	KO788/69n				GEM-201	2WF-P10	10%
C37	.025	1000	KO802/45n	P1088N-025					
C38	05	250	KO788/66n	P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	②

① Some versions may use 90mmf in this application (Part#KO845/57n).
② Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	BLAUPUNKT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A B C	2meg 1.3meg Switch	½ ½	WI2185/3x					Tone Volume, Tap ⓐ 300K

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	BLAUPUNKT PART No.	NOTES
R2	100K		WI782/70n	
R3	1meg		WI782/85n	
R4	5000Ω	1	WI802/50n	
R5	30K		WI792/62n	
R6	50K		WI782/65n	
R7	1000Ω		WI782/40n	
R8	30K	2	WI812/62n	
R9	5000Ω	1	WI802/50n	
R10	100K		WI782/70n	
R11	250K		WI782/77n	
R12	100K		WI782/70n	
R13	20K		WI782/60n	
R14	1meg		WI782/85n	
R15	500K		WI782/80n	

ITEM No.	RATING OHMS	RATING WATT	BLAUPUNKT PART No.	NOTES
R16	10meg		WI782/97n	
R17	1meg		WI782/85n	
R18	500K		WI782/80n	
R19	250K		WI782/77n	
R20	50K		WI782/65n	
R21	500K		WI782/80n	
R22	1000Ω		WI782/40n	
R23	30Ω		WI782/17n	
R24	100Ω		WI792/25n	
R25	100Ω		WI792/25n	
R26	300Ω	2		Note 1
R27	200Ω	1	WI802/29n	
R28	200Ω	1	WI802/29n	
R29	160Ω		WI792/28n	

Note 1. Some versions may use 500Ω 2 W in this application (Part #WI804/28n).

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	BLAUPUNKT PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	12V or 6V ⓐ 1A	240V ⓐ .055A		TF722/10z						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	Turns Ratio PRI.	Turns Ratio SEC.	BLAUPUNKT PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	30	: 1	TF27/52z							

COILS (RF-IF)

ITEM No.	USE	BLAUPUNKT PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Ant. Coil	WC2199/2z					
L2	IF Trap	ZF720/10z					
L3	LW Ant. Coil	WC2201/5z					
L4	BC Ant. Coil	WC2204/2z					
L5	LW Osc. Coil	WC2202/3z					
L6	BC Osc. Coil	WC2205/2z					
L7	1st IF	ZF721/1z	16-6780				
L8	2nd IF	ZF721/2z	16-6780				
L9	Fil. Choke	WC2115/1z					4.7 Microhenries
L10	"A" Lead Choke	ED706/1z					12 Microhenries
L11	"A" Lead Choke	ED706/1z					12 Microhenries

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	BLAUPUNKT PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	NOTES
M1	Interupter	6V	115∿	SM702/1z				6 Volt Versions
		12V	115∿	SM702/2z				12 Volt Versions

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT (Measured)	BLAUPUNKT PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M2	.054A	XZ737/2x			D-64 ①	① Silicon Type

FUSES

ITEM No.	TYPE	RATING	BLAUPUNKT PART No. FUSE	BLAUPUNKT PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M3		8A 32V①	SG704/1N ①	FA741/9N				

① 4 Amp Fuse #SG704/3N Used in 12 volt version.

MISCELLANEOUS

ITEM No.	PART NAME	BLAUPUNKT PART No.	NOTES
M4	Lamp	GL701/1x	7V, 0.1A (6 Volt Versions)
	Lamp	GL701/2x	14V, 0.1A (12Volt Versions)
M5	Switch	NP2306/15z	Band, Complete With Coils
	Printed Board	NP2309/3z	
	Plug	SE718/1x	Connecting Cable
	Socket	FA717/1x	Connecting Cable
	Socket	FA716/1x	Vibrator

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Push Button	KF792/1z	Long Wave, Ivory, Includes Rubber Gasket
Push Button	KF792/2z	Medium Wave, Ivory, Includes Rubber Gasket
Push Button	KF792/3z	Long Wave, Brown, Includes Rubber Gasket
Push Button	KF792/4z	Medium Wave, Brown, Includes Rubber Gasket

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Shielded Hook-up Wire ..... Use BELDEN No. 8885
Bonding Strap ..... Use BELDEN No. 8661

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

EKOTAPE
MODEL 290

EKOTAPE
MODEL 290

EKOTAPE
MODEL 290

GENERAL INFORMATION

Ekotape Model 290 is designed for either a monaural tape recorder and player, or through reproduction of both amplifiers, as a stereophonic playback instrument.

The recorder operates at 3 3/4 or 7 1/2 ips tape speed, using Class A amplifiers. Each speed selection automatically switches speed equalization networks. Speakers are automatically silenced in Fast Forward and Rewind positions through the use of a muting switch.

The Ekotape Model 290 is equipped with a control knob for remote starting and stopping of the mechanism and an index counter as a means for quick location of a previously recorded selection.

The Ekotape Model 290 is designed to operate on 60 cycle 105 to 120 volts. Before connecting to line supply, make certain that it agrees with the above specifications.

Manufactured by:
Electronic Division
Webster Electric
Racine, Wisconsin

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HOWARD W. SAMS & CO., INC., INDIANAPOLIS 6, INDIANA

C371

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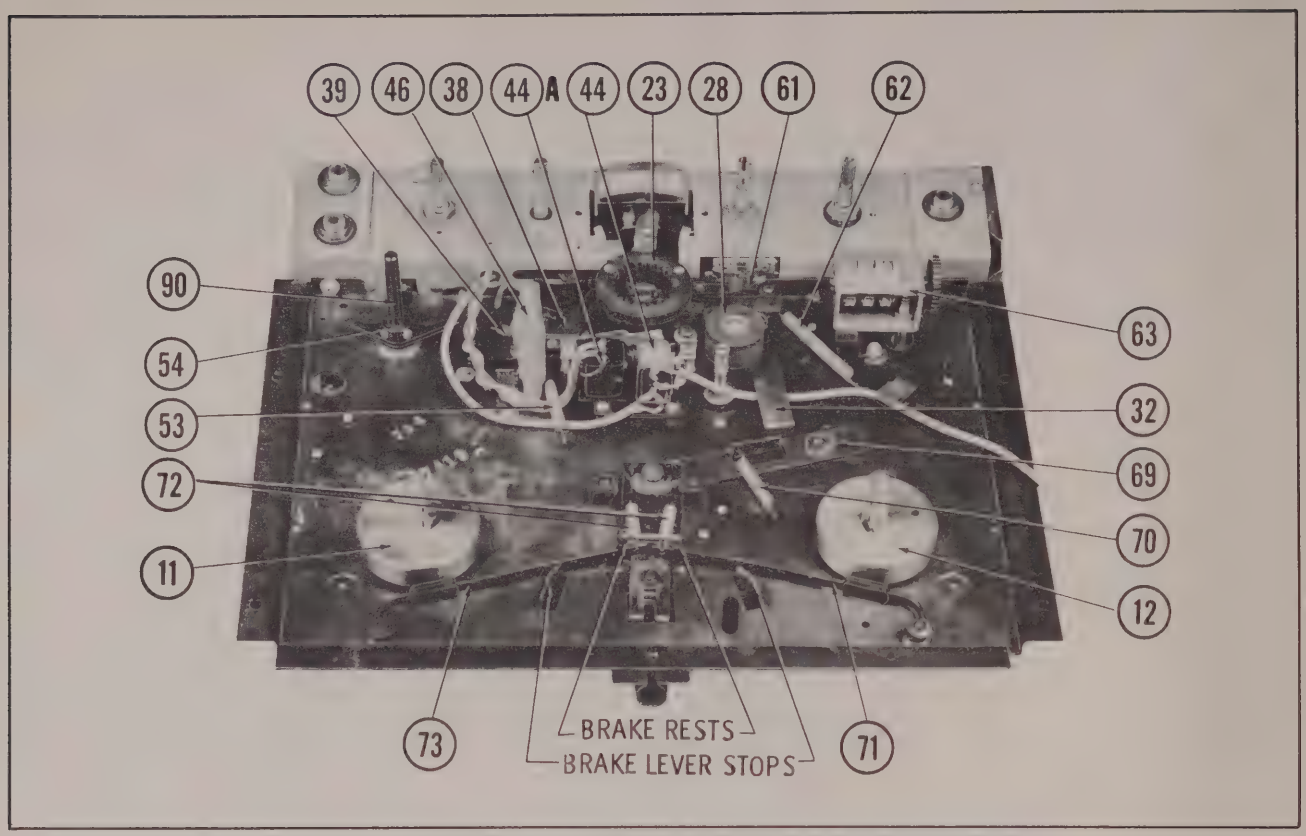


FIG. 1 TOP VIEW OF MECHANISM WITH ESCUTCHEON REMOVED

SPECIFICATIONS

HEADS: Stacked stereophonic playback head; half track recording head; separate erase head.

AMPLIFIERS: Two complete and separate amplifiers for stereophonic playback; one used for half track record and playback.

OUTPUT: 8.0 watts maximum each amplifier.

DISTORTION: 1.6% total harmonic at 6.0 watts at 400 cps. 5.5% intermodulation at 6.0 watts using 60 and 7000 cycles.

FREQUENCY RESPONSE: 30 to 15,000 cps.

SIGNAL TO NOISE RATIO: 43 db.

WOW AND FLUTTER: 0.2% maximum at 7 1/2 ips.
0.3% maximum at 3 3/4 ips.

MUTING: Built-in or external speaker is automatically silenced in "Rewind" and "Fast Forward" positions.

ERASE: Automatic erase in "Record" position. Interlocking control prevents accidental erasure of recordings.

MONOMATIC CONTROL: Single vernier geared knob for easy, simple control of tape; selects mode of operation - "Fast Forward", "Standard Forward", "Stop," And "Fast Rewind".

AUTOMATIC STOP: Switch stops motor when tape runs out in either "Forward" or "Rewind" positions.

INSTANT STOP-START: Manual control (furnished) or remote electric control (an accessory) permits stoping and starting tape instantly without disturbing other pre-set controls.

AMPLIFIER CONTROLS: Tone balancing control, combined with power on/ off switch for each amplifier. Volume control for each amplifier.

INPUTS: Radio/ Phono jack: 0.5 megohm impedance. Microphone jack: 0.5 megohm impedance. Three millivolt R.M.S. minimum signal at microphone jack drives amplifier to full power output.

SPEAKERS: Two built-in speakers -- 6" x 9" oval PM type for low and middle frequencies; 3" round PM type for high frequencies, with crossover network.

OUTPUT JACKS: External speaker jacks, matched to 8Ω impedance, provided for both amplifiers.

Head output jack provided to connect playback head to high fidelity preamplifier.

To Make a Monaural Recording with a Microphone

1. Plug power cord into receptacle on back of recorder and into 115-volt, 60-cycle AC power outlet.

2. Turn On/ Off switch to On. Allow tubes about 30 seconds to warm up.

3. With Monomatic control in Stop position, put a full reel of tape on left-hand reel spindle and an empty reel on right-hand reel spindle. Unwind 14" to 16" of tape from supply reel. Drop tape in tape slot, with dull side of tape facing you. Make sure tape lies between guide and nylon insulator of Automatic Stop switch. Wind two or three turns of tape around hub of take-up reel. Turn take-up reel by hand until all slack is taken up between reels.

4. Insert plug on end of microphone cord into Input jack.

5. Turn Tape Speed Change control to 3 3/4 or 7 1/2 ips, as desired.

6. Turn Monomatic control from Stop to Forward position.

7. Turn Record/ Listen control to Record. This control locks in Record as long as Monomatic control remains in Forward. It returns to Listen Automatically when Monomatic control is turned from Forward position.

8. To stop the tape without resetting the Record/ Listen, Volume, and Monomatic controls, insert Manual Start/ Stop control in receptacle as far as it will go; and turn a quarter-turn clockwise until it locks in place. This disengages the tape drive without turning off the motor or disturbing the other controls.

9. With tape stopped, talk into the microphone. Adjust Volume control until the Recording Level meter (M9) reads no more than 5.0 on maximum sounds. A higher reading may result in distortion.

10. If microphone is operated close to recorder, turn Speaker On/ Off switch to Off position to prevent feedback.

11. If recording several selections on one tape, set counter (63) at "000" before starting. Mark the reading at the start of each selection on the back of the tape box. The counter is so geared that a 7" reel of thin base tape (1800 ft.) takes one complete revolution of the numerals.

12. The microphone supplied with the recorder is sensitive. Do not place it closer than three feet from recorder loudspeaker during recording unless the Speaker switch is in the Off position. Best results are obtained when the microphone is placed closer to the source of sound than to any walls to prevent echoes as the sound rebounds from the wall.

13. With all controls set as outlined, release the Manual Start/ Stop control by turning one-quarter turn counterclockwise, and start recording.

NOTE: Ekotape is a twin-track recorder. During monaural recording or playback, only one-half the width of the tape is exposed or processed at a time. After a reel of tape has traveled from one reel to the other, take the full reel from the right-hand spindle, turn it over and place it on the left-hand spindle, and proceed as outlined in Step 3 to record the other half of the tape.

To Make a Monaural Recording from a Radio or Record Player

1. A radio attachment cord (Accessory SS656) is necessary. Insert the plug on this cord into Radio/ Phono Input jack and attach the two alligator clips to the terminals of the voice coil of a radio or phonograph speaker.

2. Turn radio or phonograph on and adjust all recorder controls as described in "To Make a Monaural Recording with a Microphone." It is not necessary to operate the Speaker On/ Off switch since no feedback occurs when a recording is made in this manner.

To Edit and Splice a Tape

NOTE: Since the Ekotape is a twin-track recorder, editing is impossible when both tracks are recorded or when recording is stereophonic. Twin-track recordings can be edited only by erasing unwanted portions.

To elimate unwanted portions or to correct errors in a single-track recording, simply cut the tape at the beginning and end of the portion to be removed and splice the ends with a piece of splicing tape. Cut tape at a 45° angle and butt the ends together. Be sure splicing tape is put on the back, or shiny, side of the tape. Trim edges of the splice to prevent any interference when tape moves through tape slot.

To Erase a Recording

The recorder erases automatically when the Record/ Listen control is in Record. The old recording is erased a fraction of a second before the recording head puts a new recording on tape. To erase an old recording without putting a new one on the tape, the recorder is operated in the same manner as when a recording is made, except that the Volume control is turned to the extreme counterclockwise position.

To Play a Monaurally-Recorded Tape

1. After a tape has been recorded, turn Monomatic control to Rewind to return tape to left-hand, or supply, reel. After rewinding is completed, turn Monomatic control to Stop and allow tape to come to a complete stop.

2. Move Monomatic control to Forward and turn Volume control to desired listening level.

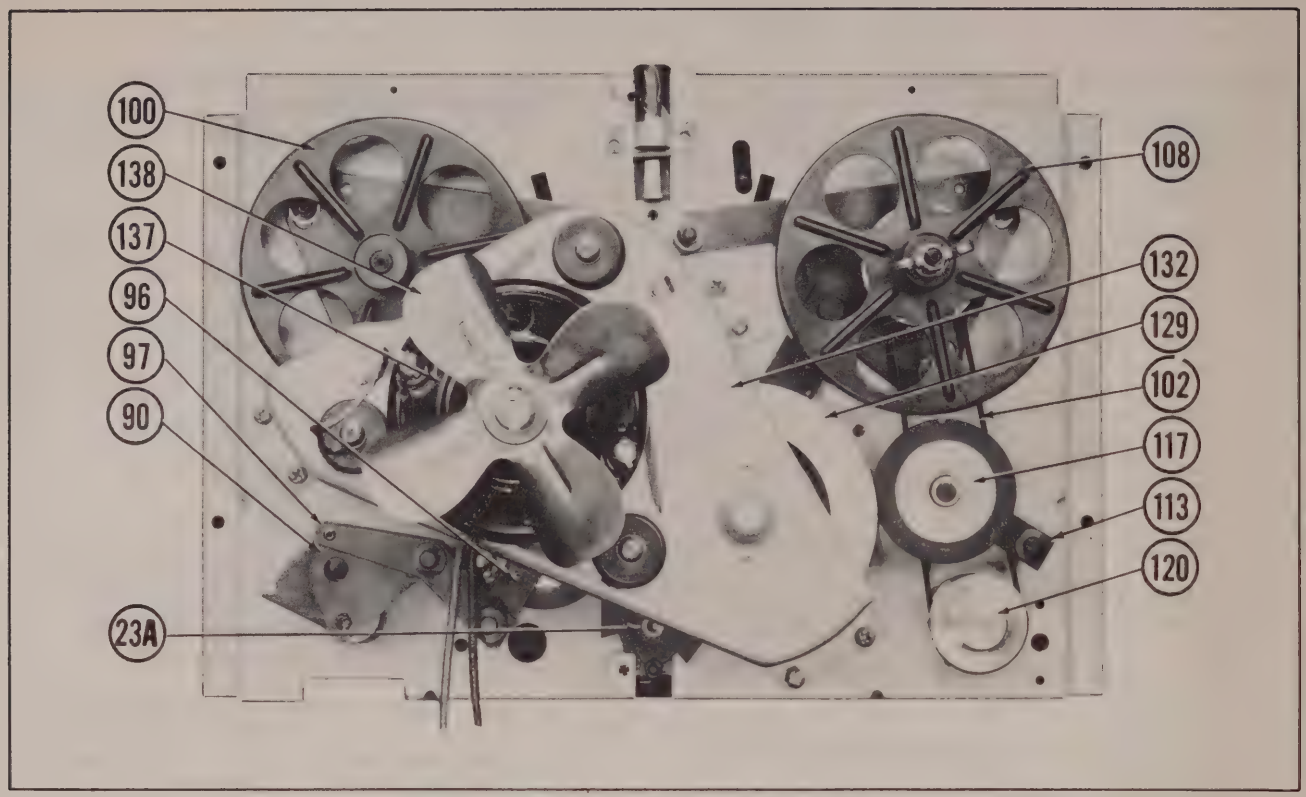


FIG. 2 BOTTOM VIEW OF MECHANISM

3. Adjust Tone control for the most pleasing balance of bass and treble. Turning this control clockwise increases the treble; turnint it counterclockwise increases the bass. In the middle position, response is termed normal, or flat.

4. An external speaker may be connected by using a radio attachment cord (SS656). Insert the plug on this cord into the Output jack and attach the clips to the external speaker terminals. The external speaker impedance should be approximately 4 ohms. With Speaker On/ Off switch in On position, sound will be heard from the recorder speakers and the external speaker; in the Off position, sound will be heard only from the external speaker.

5. To play recorder through the preamplifier of a high-fidelity system, attachment cord (SS661) should be plugged into the Head Output jack and connected to the proper preamplifier input.

6. The recorder is equipped with a tape-out or automatic stop which shuts off the motor when the tape supply has run out in either Forward or Rewind.

NOTE: Return the Monomatic control to the Stop position as soon as possible after the Automatic Stop has operated to prevent flat spots from forming on the drive mechanism. Never store the unit with the Monomatic control in Forward or Rewind position.

To Play a Stereophonic Tape

1. Thread tape as described in "To Make a Monaural Recording with a Microphone."

2. Turn On/ Off switches to On position and allow tubes about 30 seconds to warm up.

3. Turn Tape Speed Change control to 3 3/ 4 or 7 1/ 2 ips, as specified on the tape to be played.

4. Plug external speaker into Output jack. Place recorder and speaker 8 to 12 feet apart and facing slightly toward center. A second external speaker may be plugged into Output jack if desired.

5. Turn Monomatic control from Stop to Forward.

6. Turn Volume controls to desired listening level.

7. Adjust Tone controls to give the most pleasing balance of bass and treble. Turning the controls clockwise increases the treble response; turning them counterclockwise increases the bass response.

To Use Recorder as a Public Address System

1. Plug the microphone into the Input jack, leaving the Monomatic control in Stop.

2. Turn Record/ Listen control to Record; it will lock in place.

3. Adjust the Volume control to give the desired listening level from the speaker.

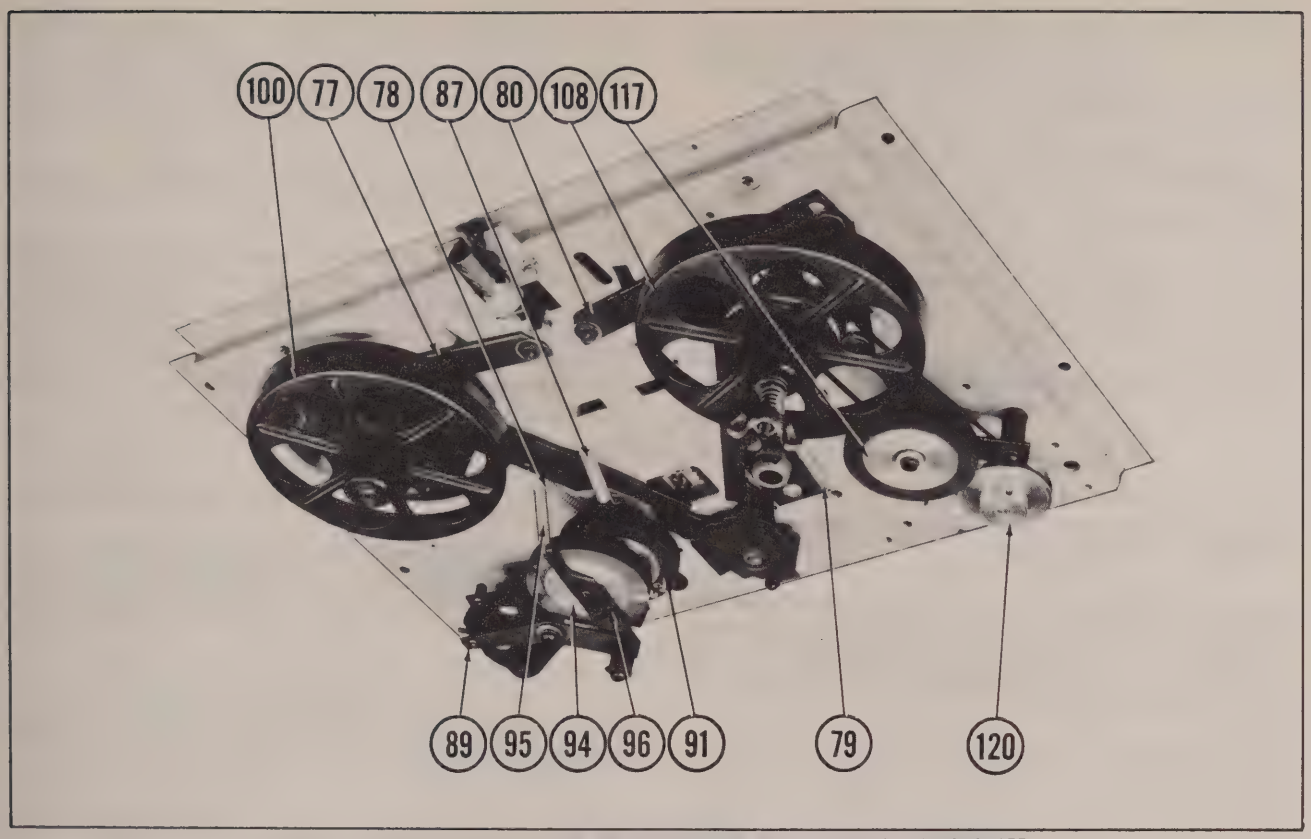


FIG. 3 BOTTOM VIEW OF MECHANISM WITH MOTOR REMOVED

DISASSEMBLY INSTRUCTIONS

All service work will require removal of the units from the carrying case with the following exceptions:

Cleaning and aligning of the head assemblies (44 & 44A), cleaning, adjustment or replacement of the brake lever assemblies (71 & 73), remote lever assembly (69), pinch roller and lever assemblies (32), and the pressure pad assembly (38).

a. Refer to Exploded View, for location of parts to their respective reference numbers. Remove head cover (10) by removing screw (9).

b. For cleaning of the head assemblies (44 & 44A) and inspection of the pressure pad (38) and muting switch cam assemblies, remove Top Panel Assembly (6) in the following manner:

1. Remove four Phillips head screws (7), their respective washers (8), and Phillips head screw (7A).

2. Loosen set screws (4) on control knobs (2 & 3) and remove knobs (2 & 3) by pulling "up".

4. Loosen set screws (4A) on stereo control knobs (3A). Knobs (3A) do not pull "off".

5. Remove hex nut (8C), steel washer (8D), and fibre washer (8E) from Stereo Speaker Jack (M3). Lift top panel assembly. Knobs (3A) remain with top panel.

c. To remove tape transport mechanism and amplifier assembly from case proceed as follows:

1. Remove seven Phillips head screws (15) and their respective washers (16) from screen panel assembly (14). Slide screen panel assembly upward to remove from its retaining grooves.

2. Unplug reproduce head plug from stereo playback amplifier assembly.

3. Unplug stereo playback amplifier assembly power plug from main amplifier assembly AC outlet.

4. Remove interconnecting ground lead between amplifier assemblies by removing screw near External Speaker Jack.

5. Turn carrying case on its baggage studs (being careful not to damage exposed speaker cones) and partially remove the unit from the case. After partial movement disconnect the speaker plug from amplifier chassis, and then proceed to remove unit completely from case.

6. To gain access to the internal wiring and components of the amplifier, remove the chassis bottom cover (remove two screws).

d. To remove stereo playback chassis perform the following:

NOTE: Removal of main mechanism and amplifier assembly must be performed before removal of playback amplifier is attempted.

1. Remove two 6AQ5 tubes (V4 & V5) and 5879 tube (V1) from chassis.

NOTE: Removal of main mechanism and amplifier assembly must be done before tubes on playback chassis can be serviced. Removal of playback amplifier chassis is not necessary to service tubes.

2. Remove two Phillips head machine screws (located on right side of case near carrying handle), their respective cup washers, lock washers, and nuts. Remove one Phillips head machine screw, its respective cup washer, lockwasher, and nut from bottom of carrying case.

3. Remove playback amplifier assembly from carrying case.

e. After servicing the units, inspect visually for signs of damage and wear, and make certain all parts are in their proper place and properly adjusted. Reassembly by reversing the procedures outlined above. When returning the units to the case be sure that speaker leads will be clear of all moving parts.

CLEANING

When improper operation of the unit calls for cleaning as indicated by the Trouble Chart, follow the procedures outlined below:

a. When trouble is caused by dirt on head assemblies (44 or 44A), clean head with a soft, dry cloth. If dirt is thick and caked on head, moisten the cloth with alcohol or another suitable solvent, and rub gently until the dirt is removed.

NOTE: Do not use a brush or an excessive amount of solvent to clean the head.

b. The flywheel and shaft assembly (129), pinch roller assembly (28), and the two tape guide spacers (59), may be cleaned in the same manner as described in "a" above.

c. If pressure pad assembly (38) has dirt on the pads, brush lightly with a stiff fibre brush. If caked with dirt, worn, or hard, replace the assembly.

LUBRICATION

GREASE SHALL BE APPLIED SPARINGLY. Only a thin film of grease is required in all cases. Remove dirty and excessive grease with alcohol or another suitable solvent before relubrication.

a. Oilite bearings are pre-lubricated for the life of the bearing. All that is necessary is light wiping with a clean rag. No further lubrication of the bearings is required.

CAUTION: Never use a cleaning solvent on oilite bearings. Any excess oil may run off the bearings and work its way onto the rubber driving surfaces, causing unsatisfactory operation of the mechanism.

b. Lubricate all cams, levers and sliding parts with a thin film of Liqui - Moly NV Grease.

ADJUSTMENTS

Testing, Adjusting And Repairing

Use the procedures outlined below to bring the equipment to peak operating efficiency after repair and overhaul or during trouble shooting services.

Stacked Stereophonic Playback Head, Erase Head, And Oscillator Adjustments

To test the oscillator, refer to the circuitry of the schematic diagram. Use an AC vacuum tube voltmeter and measure for rated voltages as shown on schematic diagram. If the tests indicate trouble in the erase head (44A), replace head in the following manner.

a. Unsolder leads from erase head (44A), see Exploded View. Remove three screws (43) holding head assembly to the mechanism plate, and lift head.

b. When installing a new erase head make connection of erase leads as indicated in Fig. 4. Tighten snugly the three mounting screws (43) over their respective head mounting springs (45). The ground lead terminal lug, see Fig. 5, should be attached to the mechanism plate with one of the head mounting screws so as to insure contact with ground. Mount lug between head spring (45) and bottom of head mounting

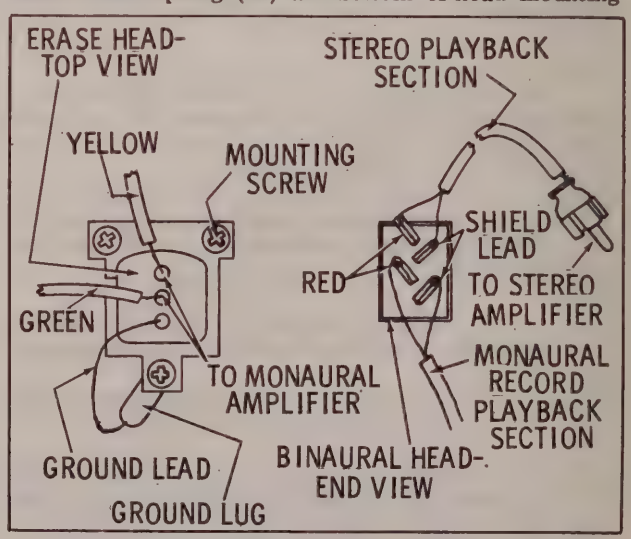


FIG. 4 DIAGRAM OF HEAD CONNECTIONS

plate. Thread the unit with tape and adjust the two front screws on the head so that tape and pressure pad assembly (38) engage the groove of the head properly. Adjust the back screw until head is level.

c. When trouble-shooting reveals a defective stacked stereophonic playback and/or half track recording head, replace head in the following manner:

1. Disconnect leads from stereo playback monaural record-playback sections of head with care. Remove three screws (43) holding head assembly to the mechanism plate and lift head.

2. When installing the new head make connections of leads as indicated in Fig. 4. Tighten snugly the three mounting screws over their respective head mounting springs (45). Thread the unit with tape and adjust the front screw on the head so that tape and pressure pad assembly (38) engage the groove of the head properly. Adjust the two screws on the back of the head for maximum output using a constant frequency tape, if available, of 7500 cycles at 7 1/2 ips. This same tape may be used at 3 3/4 ips to provide a 3750 cycle alignment signal. If not available, use a previously recorded tape and align head for maximum output of high frequency response with tone control turned to full clockwise position (treble). Above azimuth adjustment is made with the recorder functioning as a monaural unit. Proper adjustment monaurally will give optimum performance on stereo also.

Pressure Pad And Lever Adjustments

Pressure pad and lever assembly (38) should be cleaned (See "Cleaning"), adjusted or replaced in the following manner:

a. To adjust pressure pad assembly (38), remove plastic cover and top panel.

b. To remove assembly for cleaning, repair, or adjustment, remove three screws (18), bracket assembly (17), spring (39), and retaining ring (36). Rotate the pressure pad assembly slightly counterclockwise and lift off.

c. Reassemble in reverse order and re-lubricate.

d. Adjust by turning knob (2) to "Forward" position and check to be sure pads engage groove of head properly. If not, bend levers as required.

NOTE: Be sure the face of the felt pads press against the erase and record pole pieces.

Pinch Roller Adjustment

If pinch roller (28) is damaged or out of adjustment, replace, clean, and adjust in the following manner:

a. Remove top panel (6) as covered in "Disassembly Instructions", bracket and bushing assembly (17) as covered in "Pressure Pad And Lever", and cam and plate assembly (23) by loosening two set screws (24).

b. Remove springs (33) and (35), and retaining ring (30).

c. Remove both assemblies (32) and (34) from shaft attached to mechanism plate.

d. Clean thoroughly, removing old grease and dirt, and re-lubricate (see "Lubrication"). Reassemble in reverse order.

e. Adjust tab on follower lever assembly (34) so pinch roller assembly (28) engages the flywheel shaft just before brake lever assembly (73) releases supply reel pulley (11) from "Stop" position to "Forward", thereby preventing flare out of the tape on the supply reel.

Improper "Rewind" Operation

If the equipment does not perform properly in "Rewind" position, check as follows:

a. A damaged or worn clutch disc assembly (125) may be the cause of improper "Rewind". To replace a damaged motor pulley (127) and clutch disc assembly (125) remove unit from case as described in "Disassembly Instructions". Unhook springs (87) and (95), unsolder the two motor leads and remove the three mounting screws (135) and washers (134) from the support plate assembly (132). Carefully remove the assembly so as not to damage the drive idler assemblies (91) and (94). Loosen the two Allen head set screws (128) and remove assembly. Reassembly with a new pulley in reverse order.

b. A worn, damaged, or dirty supply reel shaft support assembly (77) may be responsible for improper "Rewind". To correct faulty operation, remove unit from the case as described in "Disassembly Instructions". Unsolder the motor leads. Unhook the two drive idler springs (87) and (95) from the support plate assembly (132). Remove the motor and plate assembly as described in paragraph a above. Remove six mounting screws (131) and remove support plate assembly (132). Remove flywheel (129), steel ball (130), gear and plate assembly (23), and cam and shaft assembly (23A). Loosen the two Allen head set screws (101) on the reel pulley assembly (100) to permit removal of the pulley. Pull out the reel shaft assembly (11). Unhook the spring (78) on the reel shaft support assembly (77), and remove the retaining rings (85), spring tension washers (84), and flat washers (83). This will free the reel shaft support assembly. Clean, repair, or replace any damaged or worn parts before reassembly.

Adjusting Brake Lever Assemblies

a. If tape overruns from "Rewind" to "Stop" position, remove top panel (6) and screen panel (14) as described in "Disassembly Instructions". Turn gear and shaft assembly (19) to "Rewind" position (counterclockwise as far as possible). Adjust the right brake lever assembly (71) so that the brake cup on reel shaft assembly (12) clears the brake lever pad by 1/64 inch maximum. Adjustment is made by bending the brake lever assembly (71) near the bent portion. Refer to Figure 1. Next, turn the gear and shaft assembly (19) from "Rewind" to "Stop" position, observing that the reel brake cup compresses the brake lever pad about

1/64 inch while midway between the two positions. Compression adjustment may be made by bending the brake lever stop on the mechanism panel. When the unit is in the "Stop" position, clearance must exist between brake lever assembly (71), the brake rests located on the remote lever assembly (69), and the brake lever stops located on the mechanism panel.

b. If tape overruns from "Fast Forward" to "Forward", check operation of left brake lever assembly (73) as explained in "Adjusting Brake Lever Assemblies", except with the gear and shaft assembly (19) turned to the "Fast Forward" position (clockwise as far as possible).

Correcting "Take-up" and "Fast Forward" Troubles

If the "Take-Up" or "Fast-Forward" drive does not function properly, remove unit from case "Disassembly Instructions". Check as follows:

a. If "Take-Up" or "Fast Forward" drive is weak, screw the self locking wing nut (112) so the reel shaft will not slip relative to the reel pulley assembly (108) with less than 4 inch-ounces torque.

b. If weak drive persists after the above adjustments, remove the self-locking wing nut (112), spring (111), washer (110), fibre washer (109), and reel pulley assembly (108). Check the felt pad on pulley assembly (108). If the pad is badly worn, replace the reel pulley assembly (108), but if pad shows no excessive wear, remove retaining ring (107), and clutch disk (106). Check to see if drive pin (105) is properly seated. Now, check "U" shaped washer (104) to see that it is not damaged. The washer should have an overall height of 3/32 inch. If at fault repair or replace washer. If pin (105) is worn or damaged, replace. Oil reel pulley assembly (108) slightly (see "Lubrication") and reassemble. Adjust wing nut (112) to give a torque load on the reel shaft (12) of 4-5 inch-ounces.

c. Excessive noise in "Forward" or "Fast Forward" position indicates a dirty or damaged idler assembly (117), or dirty bearings on the takeup shaft or pulley assembly. To check, remove unit from case (see Disassembly Instructions), and inspect idler assembly and determine if dirty or damaged. Clean any dirt from idler tire and bearing. Clean flywheel and shaft assembly (129), reel pulley assembly (108), (drive area only), with a suitable solvent (see "Cleaning"). Re-lubricate as necessary (see "Lubrication").

d. If noise still exists and corrective measure has been exercised, check reel shaft assembly (12). To disassemble follow procedure outlined in "Correct-Take-up and Fast-Forward Troubles" and in addition remove two set screws from pulley (103), retaining ring (82), fibre washer (81), reel shaft assembly (12), and fibre washer (13). Clean and inspect all parts for wear or damage. Clean the bearing in reel shaft support assembly (80) and inspect bearing. Re-lubricate (see "Lubrication"), replace any damaged parts, and re-assemble in order shown in Figure 5.

Remote Control Inoperative

To correct an improperly functioning remote lever assembly (69), disassemble the unit as covered in "Disassembly Instructions". Clean, repair and adjust as follows:

a. Remove the retaining rings and washers that are used to mount the lever assembly. Detach springs (70) and (72) and remove lever assembly. Clean and lubricate.

b. If pinch roller assembly (28) does not engage the flywheel and shaft assembly (129) with remote lever assembly (69) in running position, or does not disengage flywheel and shaft assembly when remote lever is in "Stop" position, adjust tab in which spring (70) is hooked so that the remote lever, when actuated to the "Stop" position causes the pinch roller to disengage the flywheel and shaft assembly with a clearance of 1/64 to 1/32 inch. Release remote lever assembly and make sure that the tab on the remote lever clears the pinch roller lever assembly (32).

Speed Selector Or Equalizer Switch Inoperative

a. If the "Speed Selector" is out of adjustment, disassemble equipment as covered in "Disassembly Instructions", and clean, repair or replace as necessary. Broken or unhooked springs (87 or 95) on drive idler assemblies or cam shaft assembly (90) being out of adjustment would be the chief causes of faulty operation. Check to see that the follower pins on the end of the lever and idler assemblies (89) and (96) drop into the recesses on the cam shaft assembly (90) when the shaft is turned to its two different positions. Adjustment is made by loosening the set screws (55 & 56) in switch cam (54) and turning cam shaft assembly (90) as required.

b. Failure of the "Equalizer Switches" (M4 & M5) may be due to the switch cam assembly (54) being loose on the cam shaft assembly (90). To adjust, turn cam shaft assembly to "off" position and set arms of switch cam assembly the same distance from equalization switch (M4). Tighten set screws (55 & 56) in this position. Check to see that mechanical linkage from (M4) to (M5) is intact.

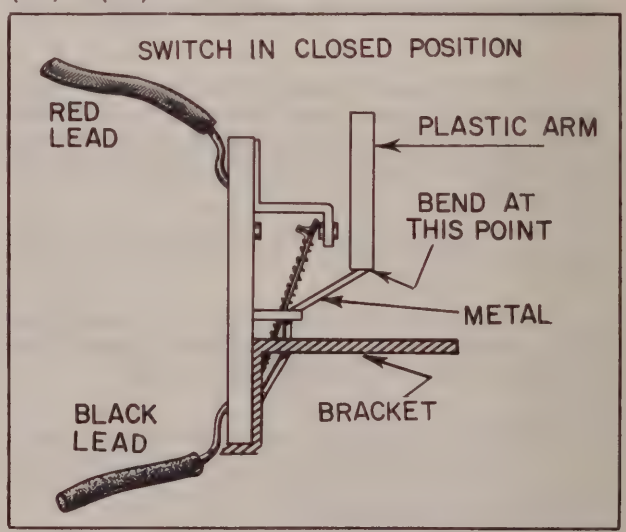


ILLUSTRATION "A"

Proper Action Of The Automatic "Take-off" Switch

The Ekotape Model 290 employs an automatic switch (M8, "Tape-off" switch) which stops the motor (137) when tape runs out in either "Rewind" or "Forward" positions. This action is accomplished by use

of switch (M8) being held in the closed position by the tape (motor running). When tape runs "out", the switch drops into "open" position, stopping the motor. This is a precision switch, and proper adjustment is important whenever the switch is replaced or the switch does not function properly.

If replacement is necessary, order the complete switch and bracket assembly (Item 46 on Exploded View) Part No. 242-24018. This assembly is pre-adjusted before shipment; however, it is still advisable to check proper action before installation. Correct action is such that as the plastic arm is moved to the "closed" position, and just as the switch snaps, the arm should be vertical to the bracket. If this is not the case the arm should be bent so proper action is developed. Use a long nose pliers, bending at the metal section of the arm as shown in illustration (A).

Illustration (A). "Tape-off" Switch Adjustment

To check the pre-adjustment, fasten switch to mechanism plate by means of two screws (47), threading leads per original. Be sure to solder black lead to terminal strip directly under 5Y3 tube (V7) socket and red lead to bottom pin on A. C. receptacle. Then hold bracket and switch in the extreme position away from guide post, and turn screws (47) "in" just enough to hold bracket in place; note position of switch arm as unit is indexed to "Play" position. If arm hangs "up", move the bracket so that plastic arm falls into the guide post. Then note action of arm when tape runs "out" in both "Forward" and "Rewind" position. The arm should not be centered so that the arm will fall into the post in either "Rewind" or "Forward" position when tape runs "out". Proper setting of arm to post is made by moving switch and bracket slightly as needed. After adjustment, tighten the two screws.

After the above adjustment is made, place the recorder in "Forward" position without tape, and the motor should remain "off". If the motor still runs, the switch is not in the "open" position and the metal bracket should be bent downwards until the switch moves to "open" and motor remains "off". Bracket can be bent by use of a screw driver set on top of it, slightly tapping the screw driver handle with the hand.

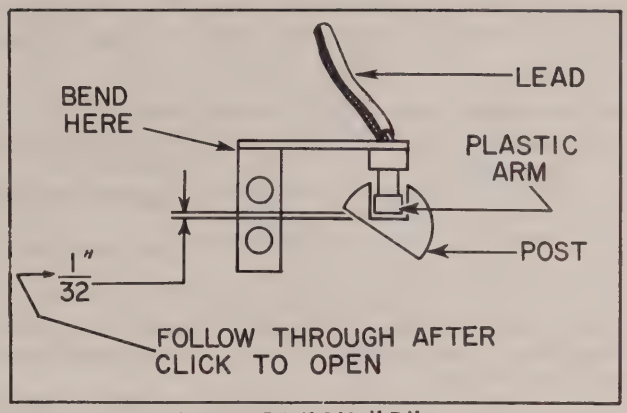


ILLUSTRATION "B"

Illustration (B). "Tape-off" Switch Adjustment

The switch action is correct when the arm moves into post and snaps into "open" about 1/ 32 of an inch before coming to rest on the post. If this position is set too far away, the switch will open in the "Rewind" position and at times even in the "Forward" position.

After above settings have been made, a final operating check should be made to be sure that pressures on the switch leads in assembly has not disrupted the settings.

EKOTAPE MODEL 290

TROUBLE CHART--STEREO AMPLIFIER ASS'Y.

TROUBLE	CAUSE	REMEDY
No visual signs of power being supplied. On-off switch on main amplifier assembly turned "on".	Power supply defect.	Check A C outlet on main amplifier chassis. Check power plug on stereo unit. See ("Disassembly Instructions"). Check "on-off" tone control (R2) knob and flexible shaft imperative to "on-off" switch operation. (If set screws are secure, a distinct "click" should be heard when switch is turned "on".)
	Defective "on-off" switch.	Replace.
No sound reproduction. Monaural amplifier functioning properly.	Amplifier trouble.	See (" Disassembly Instructions"). Check voltages and resistance as designated on schematic diagram.
	Dirty head (44).	Clean. Do not remove or change position of head. See ("Disassembly Instructions" and "Cleaning".)
	Stereo playback section of head inoperative.	Check head coil continuity. See ("Stacked Stereophonic Playback Head, Erase Head, And Oscillator Adjustments.
	Faulty tube.	Check tubes. Replace defective tube or tubes.

FOLDER 6

TROUBLE CHART--STEREO AMPLIFIER ASS'Y. (CON'T).

TROUBLE	CAUSE	REMEDY
	Open input circuit.	Check stereo input plug and socket (M2).
	Open output circuit.	Check stereo speaker jack. Check external speaker system.
	Defective volume control (R1).	Replace. See("Disassembly Instructions"). Check flexible linkage for slippage.
Loud hum.	Open power supply filter capacitor (C1) or (C2).	Check and replace.
	Bad 5879 (V1) tube.	Replace.
	Open input circuit.	Check stereo input cable ground lead for break or disconnection.
Poor high frequency response. Frequency response on monural amplifier normal.	Bad tone control (R2) or defective component in tone control circuitry.	Check and replace as required. See ("Disassembly Instructions").
	Pressure pad not seating properly.	Readjust.
	Dirty head (44).	Clean. See ("Disassembly Instructions" and "Cleaning").
	Defective external stereo speaker system.	Check response of speaker system.
Distorted bass response.	Bad component in tone equalization network.	Check and replace defective components.
	Defective 6AQ5 (V4 & V5) output tubes.	Check and replace if defective.
	Defective external stereo speaker system.	Check overall response of speaker system.
	Dirty head (44).	Clean. See ("Disassembly Instructions" and "Cleaning").

TROUBLE CHART -- MAIN MECHANISM AND AMPLIFIER ASS'Y.

TROUBLE	CAUSE	REMEDY
Motor (137) and amplifier inoperative with switch "on".	Power supply defect.	Check voltages and resistances as designated on schematic diagram.
	Damaged power cord.	Repair or replace.
	Broken or defective tone control switch.	Replace switch.
No sound or sound is fuzzy, faint, or distorted.	Over-recorded or under-recorded tape.	See "Operating Instructions"
	Amplifier trouble.	Check voltages and resistances as designated on schematic diagram.
	No bias current.	Oscillator tube (V6) defective. Open bias oscillator circuit. Loose connections to record head. Bad oscillator coil (L1).
	Pressure pads not operating properly.	See "Pressure Pad and Lever Adjustments".
	Dirty head (44).	Clean. Do not remove or change position of head (See "Cleaning").

TROUBLE CHART --MAIN MECHANISM AND AMPLIFIER ASS'Y. (CON'T).

TROUBLE	CAUSE	REMEDY
	Worn or dirty pressure pads.	Clean or replace. (See "Pressure Pad and Lever Adjustments").
	Record head coil inoperative.	Check oscillator Bias voltage and head coil continuity. (See "Stacked Stereophonic").
No sound but motor operates and tubes light.	Amplifier trouble.	Check voltages and resistances as designated on schematic diagram.
	Open circuit to speaker.	Check speaker cable continuity. Check speaker switch(M7) operation. Check operation of muting switch. Check external speaker jack.
Erase incomplete or no erase.	Dirty head (44A).	Clean. (See "Cleaning").
	Oscillator not operating.	Check voltage from oscillator coil (L1) tap (terminal 2) to ground with an a-c vacuum tube voltmeter. Should read at least 45 VAC.
	Damaged erase coil.	Check continuity.
	Pressure pads worn, damaged, or out of adjustment.	Adjust or replace. (See "Pressure Pad and Lever Adjustments").
Does not record.	Faulty microphone or cord.	Replace.
	Faulty input jack.	Check and replace.
	Faulty tube.	Check tubes V2 - V7.
	Low bias voltage.	Check voltage across full oscillator coil(L1)secondary winding (terminals 1 & 3) with an a-c vacuum tube voltmeter. Should read at least 180 VAC.
	Dirty Head (44 or 44A)	Clean.
	Pressure pads worn, aged, or out of adjustment.	Adjust or replace. (See "Pressure Pad and Lever Adjustments.").
	Open play-record coil.	Check continuity.
No playback; amplifier hiss only.	Open play-record coil	Check continuity.
	Open input circuity.	Check selector switch (M3).
	Faulty tube.	Check V1.
Howl or ringing sound during playback.	Microphonic tube	Replace defective tube.
	Acoustical feedback when recorded.	Erase tape and record with speaker "off", or move microphone away from speaker.
Poor high frequency response.	Bad component in equalization network.	Check and replace defective components in equalization circuitry.
	Dirty head (44).	Clean.
	Pressure pads worn, damaged or out of adjustment.	Adjust or replace. (See "Pressure Pad and Lever Adjustments").

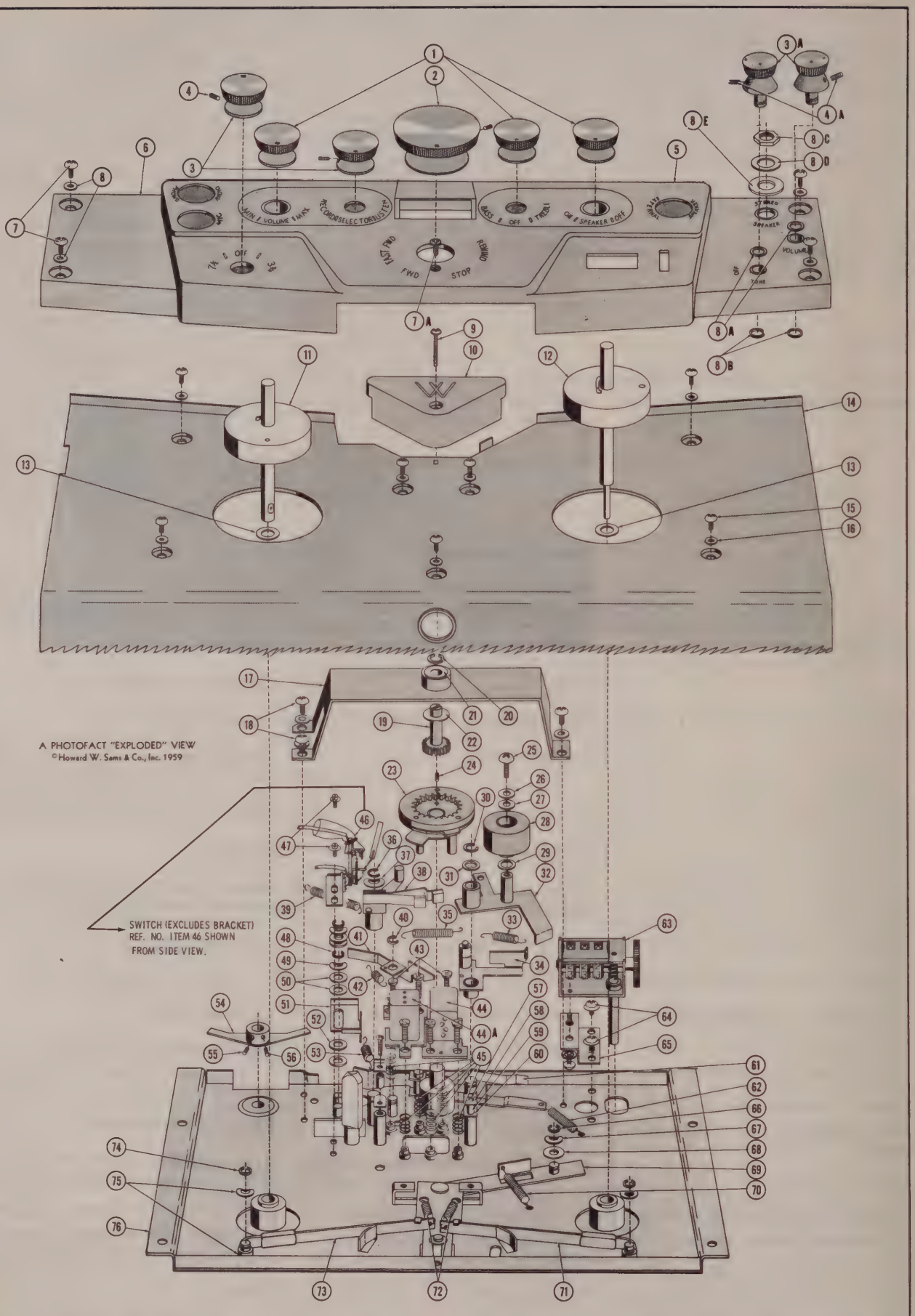
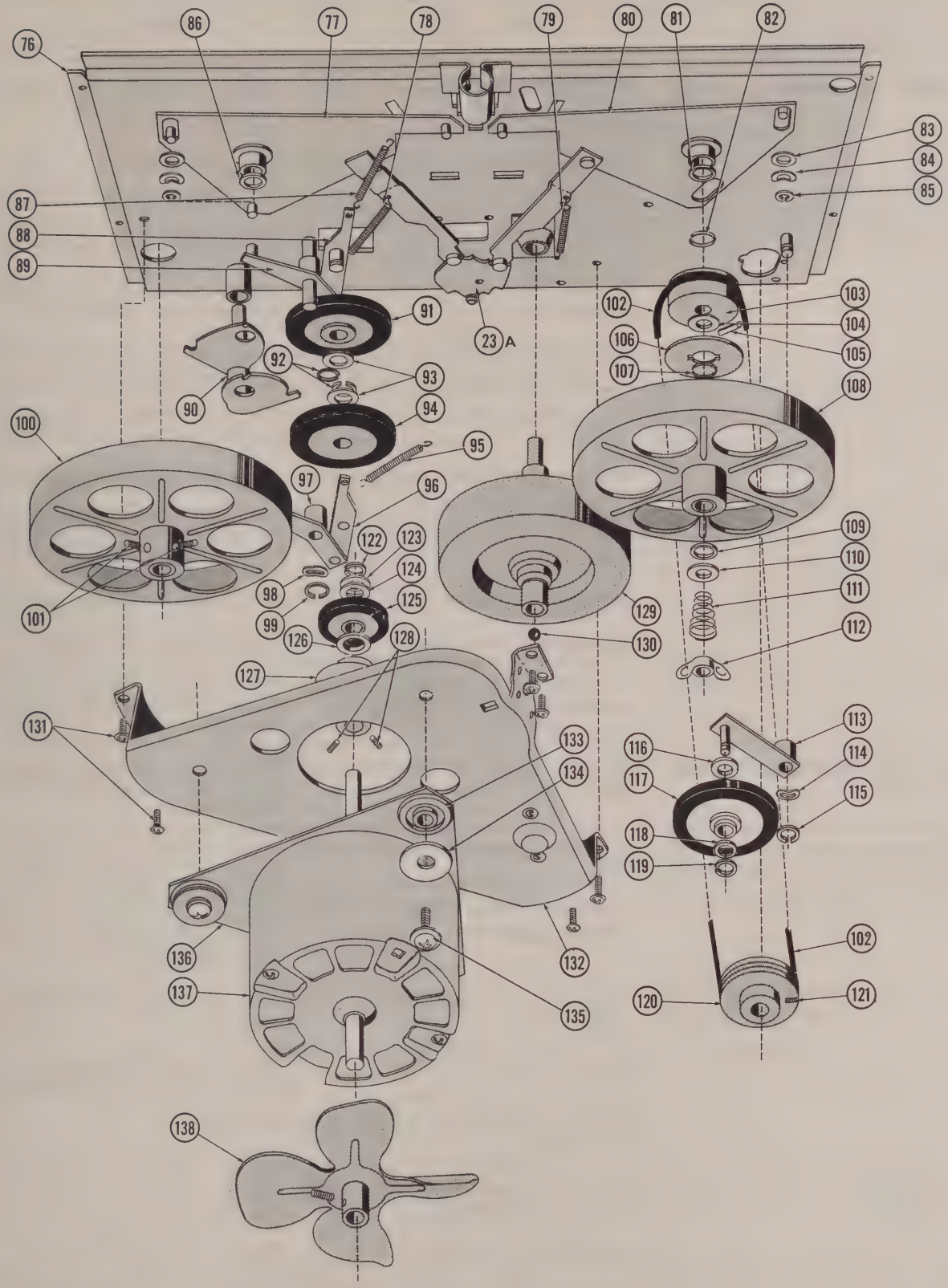


FIG. 5A EXPLODED VIEW OF PARTS ABOVE BASEPLATE



A PHOTOFACT "EXPLODED" VIEW
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FIG. 5B EXPLODED VIEW OF PARTS BELOW BASEPLATE

TROUBLE CHART -- MAIN MECHANISM AND AMPLIFIER ASS'y (CON'T)

TROUBLE	CAUSE	REMEDY
Loud hum on playback.	Bad tone control switch.	Replace switch.
	Bad 5879 (V1) tube.	Replace.
	Open power supply filter capacitor (C1) or (C2).	Check and replace.
Recording unintelligible on playback.	Improper record bias.	Check oscillator circuit components. Replace bad parts.
	Pressure pads worn, damaged, or out of adjustment	Adjust or replace. (See "Pressure Pad and Lever Adjustments").
	Malfunction in playback pre-amplifier circuit.	Check circuit components & (V1). Replace defective parts.
Distorted bass response.	Bad component in equalization network.	Check and replace defective components in tone control circuitry.
	Defective 6AQ5 (V4 & V5) output tubes.	Check and replace if necessary.
	Dirty head (44).	Clean. (See "Cleaning").
Output muffled or low.	Dirty head (44).	Clean. (See "Cleaning").
	Weak amplifier tube.	Check tubes and replace as required.
	Bad microphone or cable.	Check, repair, or replace.
Tape overruns from "Rewind" to "Stop".	Damaged, worn, or improperly adjusted take-up reel brake (71).	Check brakes. Repair, replace, or adjust. (See "Adjusting Brake Lever Assemblies").
Tape overruns from "Fast Forward" to "Forward".	Worn, damaged, or improperly adjusted supply reel brake.	Check brakes. Repair, replace, or adjust. (See Adjusting Brake Lever Assemblies").
"Take-up" or "Fast Forward" inoperative, noisy, or irregular.	Worn or improperly adjusted clutch (106).	Repair, replace, or adjust. (See Correcting "Take-Up" and "Fast Forward" Troubles").
	Brake dragging on supply reel.	Adjust brakes. (See"Adjusting Brake Lever Assemblies").
	Take-up reel support (80) dirty or damaged.	Clean, lubricate, or replace as necessary.
	Worn or damaged idler (117).	Replace. (See"Correcting"Take-Up" and "Fast Forward" Troubles).
	Take-up reel support plate spring (79) broken.	Replace.
Noisy operation in "Stop" and "Forward" position.	Worn or damaged idlers (91), (94), (117), or dry bearings.	Repair, replace or lubricate.
	Damaged idler link (113).	Repair.
Tape flares out on supply reel when engaging remote lever assembly.	Worn or damaged supply reel brake, or broken spring (72).	Replace. (See"Adjusting Brake Lever Assemblies").
Remote lever assembly not functioning properly.	Broken return spring (70) or dirty lever assembly (69).	Replace spring (70). (See "Remote Control Inoperative"). Lubricate lever (69).
	Pinch roller (28) does not disengage capstan.	Adjust lever assembly (69). (See "Remote Control Inoperative").

TROUBLE CHART--MAIN MECHANISM AND AMPLIFIER ASS'Y. (CON'T).

TROUBLE	CAUSE	REMEDY
Inoperative control knob.	Loose knob set screw (4).	Tighten
	Loose set screw (24) in pinch roller cam assembly (23).	Adjust cam (23) to proper position and tighten.
Speed selector not functioning properly.	Broken springs (87 or 95) on drive idler assemblies.	Replace. (See "Speed Selector or Equalizer Switch Inoperative").
Unit inoperative when control knob is operated.	Loose control cam (23A).	Adjust and tighten.
	Damaged or worn cam (23A) or shaft and gear (19) assembly.	Replace.
Poor equalization in either or both speeds.	Switch cam assembly (54) loose.	Adjust. (See "Speed Selector or Equalizer Switch Inoperative").
	Bad equalization switch (M4 or M5).	Replace. (See "Speed Selector or Equalizer Switch Inoperative").
	Bad equalization circuit component.	Replace defective component.
Counter inoperative.	Broken belt (102).	Replace belt (102).
Pilot light out, all other operation normal.	Bad pilot light (M2).	Replace pilot light (M2).
"Monkey Chatter" in "Fast Forward- or "Rewind" positions.	Bad muting switch (M6).	Replace.
	Muting switch (M6) tab bent.	Adjust.
"Wow" during operation of recorder.	Dragging brake.	Check brake and correct if bad.
	Clutch (106) too tight.	Adjust.
	Oil on drive surface.	Check drive surface and clean. (See "Cleaning").
"Flutter" during operation of recorder.	Dirty head (44), pressure pads, flywheel and shaft assembly, or pinch roller (28).	Clean. (See "Cleaning").
"Tape-off switch (M8) functions improperly.	Mal-adjustment.	See "Proper Action Of The Automatic "Tape-Off" Switch".
	Dirty slide lever (51).	See "Lubrication".
	Improper action between function cam (23), kickout lever (41), and slide lever (51).	Check for proper operation.
	Broken spring (53).	Replace.
Tubes light, amplifier functioning; but motor (137) inoperative.	"Tape-off" switch (M8).	Check that control knob (2) is in "Stop" position.

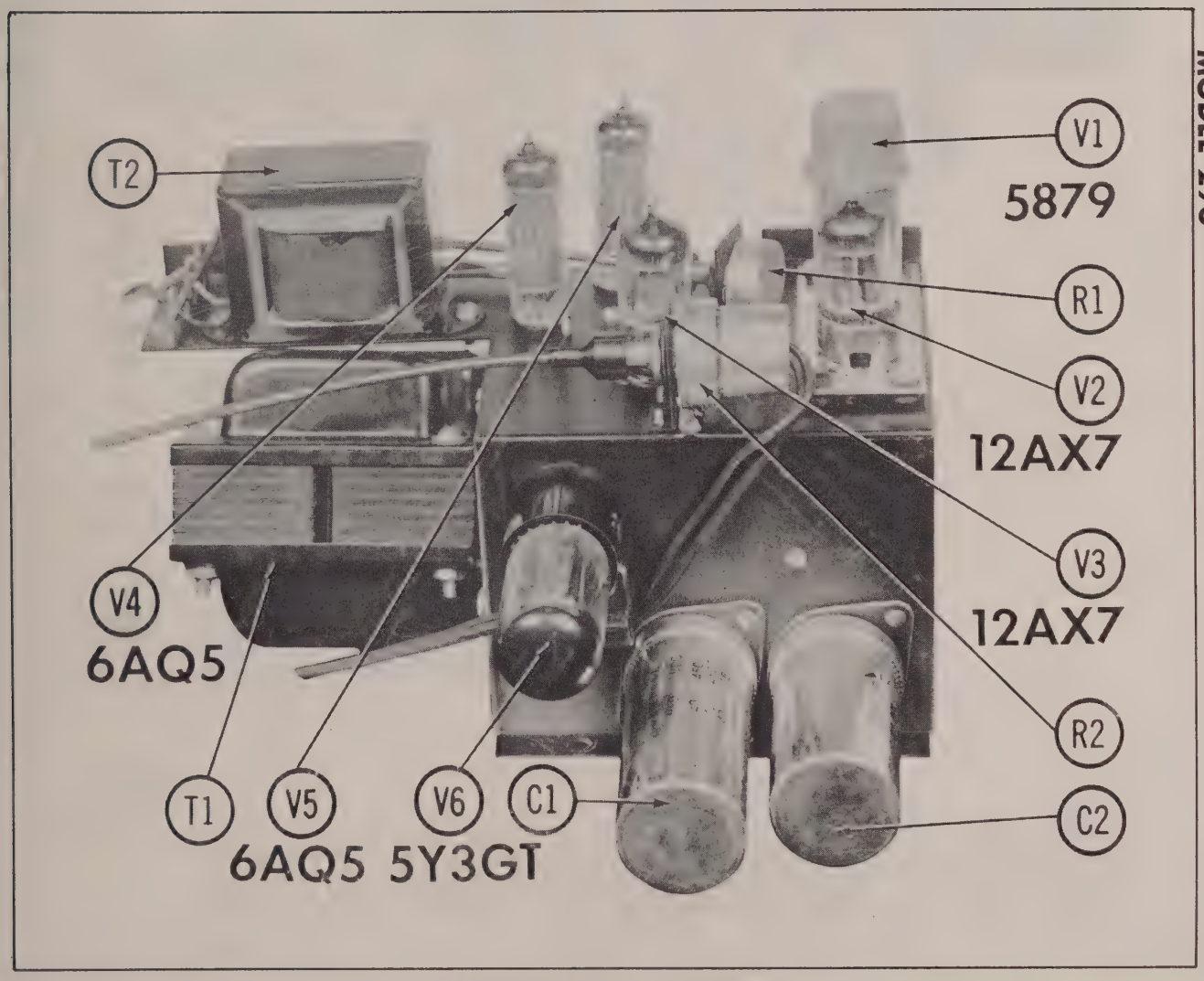
MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	241-24064	Knob
2	242-24068	Knob Assembly
3	242-24066	Knob Assembly
3A	242-24140	Knob Assembly, Stereo Amp.
4	241-15116	Set Screw, Knob
4A	29540-9	Set Screw, Cup Point(Knob)-#8 - 32 x 3/16
5	241-20433-3	Cover, Plastic
6	241-24061-1	Top Panel
7	29529-69	Phillips Pan Hd. Mach.Screw
7A	29529-70	Phillips Pan Hd. Mach.Screw #4 - 40 x 5/16
8	29602-111	Washer
8A	241-17722	Washer, Fibre
8B	29650-1	Retaining Ring
8C		Hex Nut
8D		Steel Washer
8E		Fibre Washer
9	29529-27	Phillips Pan Hd. Mach. Screw, #4 - 40 x 1
10	241-20434-4	Head Cover, Plastic
11	242-17761	Reel Shaft Assembly
12	242-17771-5	Reel Shaft Assembly
13	241-17770	Washer
14	242-24059	Screen Panel Assembly
15	29529-68	Phillips Pan Hd. Mach. Screw
16	29602-103	Washer
17	242-24041	Bracket & Bushing Ass'y.
18	241-16306	Sems Fastener
19	242-24038	Gear & Shaft Ass'y.
20	29656-2	Retaining Ring
21	241-17723	Washer, Spring Tension
22	241-17722	Washer
23	242-24030	Cam & Plate Ass'y.
23A	242-24028	Cam & Shaft Assembly
24	29540-9	Cup Point Set Screw
25	29527-4	Screw
26	29602-103	Washer
27	241-17747	Washer
28	242-17744	Pinch Roller Assembly
29	241-17722	Washer
30	29650-1	Retaining Ring
31	241-17722	Washer
32	242-17741	Pinch Roller Lever Ass'y.
33	241-12138	Spring
34	242-17739	Follower Lever Assembly
35	241-14252	Spring
36	29650-1	Retaining Ring
37	241-17723	Spring Tension Washer
38	242-17748-7	Pressure Pad Assembly
39	241-24556	Spring
40	29651-1	Retaining Ring
41	242-24024	Kickout Lever Ass'y.
42	241-24027	Spring
43	29525-6	#4 - 40 x 3/8 Phillips Flat Hd. Mach. Screw
44	241-24276	Record Head
44A	242-24074	Erase Head Ass''y.
45	241-24075	Head Mtg. Spring
46	242-24018	Switch & Bracket Ass'y.
47	241-18841	#4 - 40 x 3/16" Pan Hd. Sems Fastener
48	29651-1	Retaining Ring
49	241-12059	Spring Tension Washer
50	29602-154	Washer
51	241-24023	Slide Lever
52	29602-154	Washer

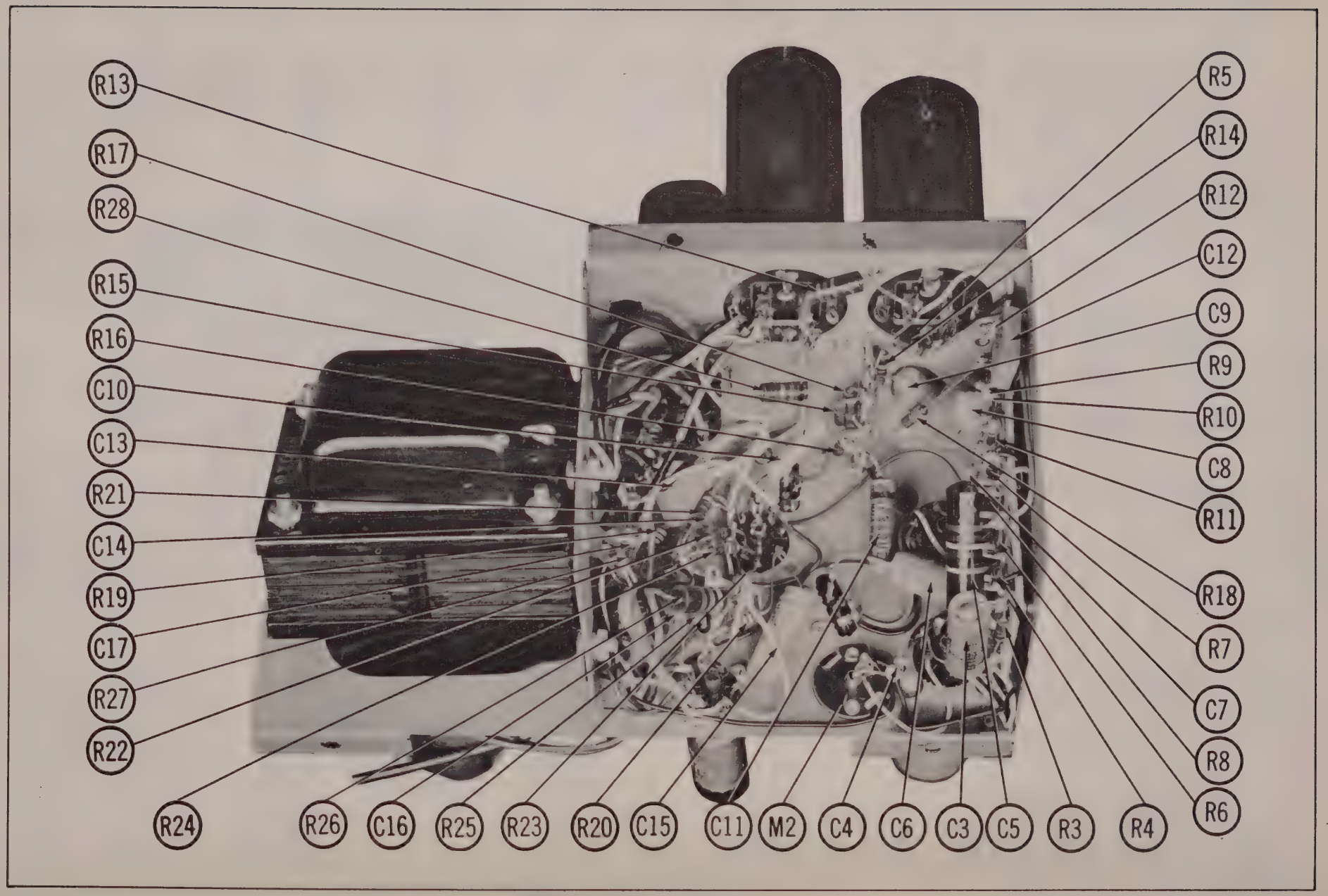
Ref. No.	Part No.	Description
53	241-17734	Spring
54	242-17728	Switch Cam Ass'y.
55	29540-9	Cup Pt. Set Screw
56	29542-5	Cone Pt. Set Screw
57	29527-13	#4 - 40 x 1/2" Rd. Hd. Mach. Screw
58	241-17754	Top, Tape Guide
59	241-17753	Spacer, Tape Guide
60	241-17752	Shelf, Tape Guide
61	242-17713-4	Index & Interlock Lever Assy.
62	241-17802	Spring
63	241-20477-1	Counter
64	241-17886	#6 - 32 x 3/16" Sems Fastener
65	241-20478	Bracket
66	29651-1	Retaining Ring
67	241-12059	Spring Tension Washer
68	29602-124	Washer
69	242-17755	Remote Lever Ass'y.
70	241-17734	Spring
71	241-17758-3	Brake Lever Ass'y.
72	241-17734	Spring
73	241-17758-3	Brake Lever Ass'y.
74	29651-4	Retaining Ring
75	241-12059	Spring Tension Washer
76	242-17683-9	Mechanism Plate Ass'y.
77	242-17695-3	Reel Shaft Support Ass'y. (left)
78	241-17802-1	Spring
79	241-17801	Spring
80	242-17703-4	Reel Shaft Support Ass'y. (right)
81	241-17770	Washer
82	29650-2	Retaining Ring
83	29602-124	Washer
84	241-12059	Spring Tension Washer
85	29651-4	Retaining Ring
86	241-17770	Washer
87	241-17802	Spring
88	241-17735	Idler Link
89	241-17733	Follower Lever
90	242-17724-2	Cam Shaft Ass'y.
91	242-17719-3	Idler Assembly
92	29650-1	Retaining Ring
93	241-17722-1	Washer
94	242-17719-3	Idler Assembly
95	241-17802	Spring
96	241-17735	Idler Link
97	241-17733	Follower Lever
98	241-17723	Spring Tension Washer
99	29650-1	Retaining Ring
100	242-17766	Reel Pulley Assembly
101	29540-9	Set Screw, Cup Point
102	241-20481	Belt
103	241-20479	Pulley
104	241-17775	Washer
105	241-17086-4	Pin
106	241-17777	Clutch Disc
107	29650-2	Retaining Ring
108	242-17773	Reel Pulley Assembly
109	241-20551	Fibre Washer
110	29602-102	Washer
111	241-17644	Spring
112	241-17799-1	Self Locking Wing Nut
113	241-17717	Idler Link
114	241-17723	Spring Tension Washer
115	29650-1	Retaining Ring

Ref. No.	Part No.	Description
116	241-17722-1	Washer
117	242-17719-3	Idler Assembly
118	241-17722-1	Washer
119	29650-1	Retaining Ring
120	241-20480	Pulley
121	29540-1	Cup Point Set Screw, #6 - 32 x 3/16
122	29650-6	Retaining Ring
123	241-17795	Spring Tension Washer
124	241-17794	Washer
125	242-17791	Clutch Disc. Ass'y.
126	241-17793	Motor Pulley clutch Disc.
127	241-17789-2	Motor Pulley
128	29540-9	Cup Point Set Screw, #8 32 x 3/16

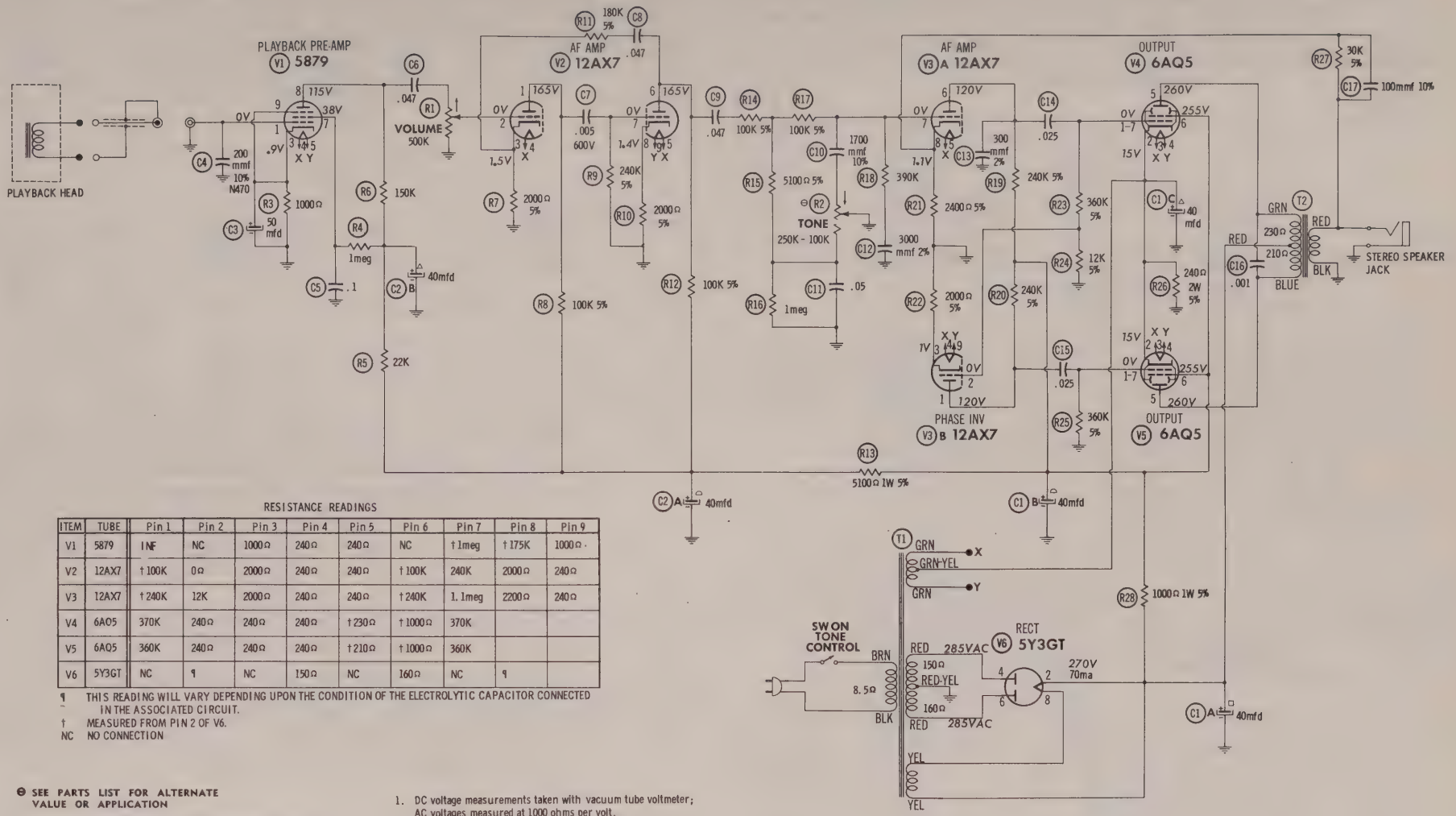
Ref. No.	Part No.	Description
129	242-17778-1	Flywheel & Shaft Ass'y.
130	241-13609	Ball
131	241-16306	#8 - 32 x 1/4 Sems Fastener
132	242-17765-3	Support Plate Ass'y.
133	241-17787	Shock Mount
134	241-17763	Washer
135	241-17827	#10 - 32 x 11/16 Sems Fastener
136	241-17786-3	Motor Mounting Plate
137	241-20800	Motor
138	241-14134	Fan



STEREO CHASSIS - TOP VIEW



STEREO CHASSIS - BOTTOM VIEW



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	5879	INF	NC	1000Ω	240Ω	240Ω	NC	†1meg	†175K	1000Ω
V2	12AX7	†100K	0Ω	2000Ω	240Ω	240Ω	†100K	240K	2000Ω	240Ω
V3	12AX7	†240K	12K	2000Ω	240Ω	240Ω	†240K	1.1meg	2200Ω	240Ω
V4	6AQ5	370K	240Ω	240Ω	240Ω	†230Ω	†1000Ω	370K		
V5	6AQ5	360K	240Ω	240Ω	240Ω	†210Ω	†1000Ω	360K		
V6	5Y3GT	NC	¶	NC	150Ω	NC	160Ω	NC	¶	

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 2 OF V6.
NC NO CONNECTION

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

EKOTAPE
MODEL 290

STEREO SCHEMATIC

STEREO PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Playback Pre-Amp	5879	
V2	AF Amp.	12AX7	
V3	AF Amp. -Phase Inv.	12AX7	
V4	Output	6AQ5	
V5	Output	6AQ5	
V6	Rectifier	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA EKOTAPE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■ 40	450	241-14238	AFH3-134	C1080	FP369.1	TMT-134	T-685	TVL-3744.2
B	▬ 40	450							
C	▲ 40	25							
C2A	▬ 40	450	241-14236	AFH2-57	B0450	FP238	TMD-54	D-235	TVL-2764
B	▲ 40	450							
C3	50	6	S6063	SRE6V50	BBR50-6	TC29	TD-50-6	MMT-650	TVA-1100

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA EKOTAPE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	200		S6065-3						N470 10%
C5	.1	400	211-13083	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C6	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C7	.005	600	S4512	P688N-005	D6-502	CUB6D5	GEM-625	6TM-D5	
C8	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C9	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C10	1700		241-14260-2						10%
C11	.05	200	241-14912	P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C12	3000		211-19827				MCE461		2%
C13	300		211-19833				MCE241		2%
C14	.025	400	S4282	P488N-025			GEM-4125	4TM-S25	
C15	.025	400	S4282	P488N-025			GEM-4125	4TM-S25	
C16	.001	600	241-12167-2	P688N-001	D6-102	CUB6D1	GEM-621	6TM-D1	
C17	100		S6065-2	NPO-S1100	D6-101	L10T1	ZT-531	5TCC-T1	10%

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA EKOTAPE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500K	½	241-17940-3	B-60	A47-500K-Z	Q13-133	U48	Volume
B	Shaft			Not Req.	RS-2	Not Req.	Not Req.	
R2A	250K-100K	½	241-17941-3					Tone Note 1
B	Switch							

Note 1. Element is open making ranges of 250K & 100K.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	EKOTAPE PART No.	NOTES
R3	1000Ω		29501-11	
R4	1meg		29501-57	
R5	22K		29501-29	
R6	150K		29501-44	
R7	2000Ω 5%		29501-14	
R8	100K 5%		29501-40	
R9	240K 5%		29501-48	
R10	2000Ω 5%		29501-14	
R11	180K 5%		29501-46	
R12	100K 5%		29501-40	
R13	5100Ω 5%	1	29501-75	
R14	100K 5%		29501-40	
R15	5100Ω 5%		29501-21	
R16	1meg		29501-57	
R17	100K 5%		29501-40	
R18	390K		29501-113	
R19	240K 5%		29501-48	
R20	240K 5%		29501-48	
R21	2400Ω 5%		29501-15	
R22	2000Ω 5%		29501-14	
R23	360K 5%		29501-50	
R24	12K 5%		29501-25	
R25	360K 5%		29501-50	
R26	240Ω 5%	2	29501-90	
R27	30K 5%		29501-32	
R28	1000Ω 5%	1	29501-71	

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA EKOTAPE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @.50A	540VCT @.070A	5V @1.8A	242-21908	P9206			PC8404	24R13U	R-10A
	SEC. 3	SEC. 4	SEC. 5							
	6.3VCT @2A									

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA EKOTAPE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	5500Ω CT	3-4Ω	242-21783-1	Z1011	A-2935	AU-609	A-3870	22S58	S-55X	

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	241-24064	Volume, Bass-Treble, Speaker-Off-On
Knob	242-24068	Assembly, Forward-Rewind
Knob	242-24066	Assembly, Tape Speed, Record-Listen
Knob	242-24140	Assembly, Stereo Amp
Cover	241-20433-3	Plastic
Cover	241-20434-4	Head, Plastic
Panel	241-24061-1	Top

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

Low-Loss Shielded Lead (Interconnecting) .....Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)

PARTS LIST AND DESCRIPTIONS

MAIN AMP

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Playback Pre-Amp	5879	
V2	AF Amp.	12AX7	
V3	AF Amp. -Phase Inv.	12AX7	
V4	Output	6AQ5	
V5	Output	6AQ5	
V6	Bias Osc.	6AQ5	
V7	Rectifier	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA EKOTAPE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲ 40	450	241-14236	AFH2-57	B0450	FP238	TMD-54	D-235	TVL-2764
B	▲ 40	450							
C2A	▲ 40	450	241-14238	AFH3-134	C1080	FP369.1	TMT-134	T-685	TVL-3744.2
B	■ 40	450							
C	▲ 40	25							
C3	50	6	S6063	SRE6V50	BBR50-6	TC29	TD-50-6	MMT-650	TVA-1100

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

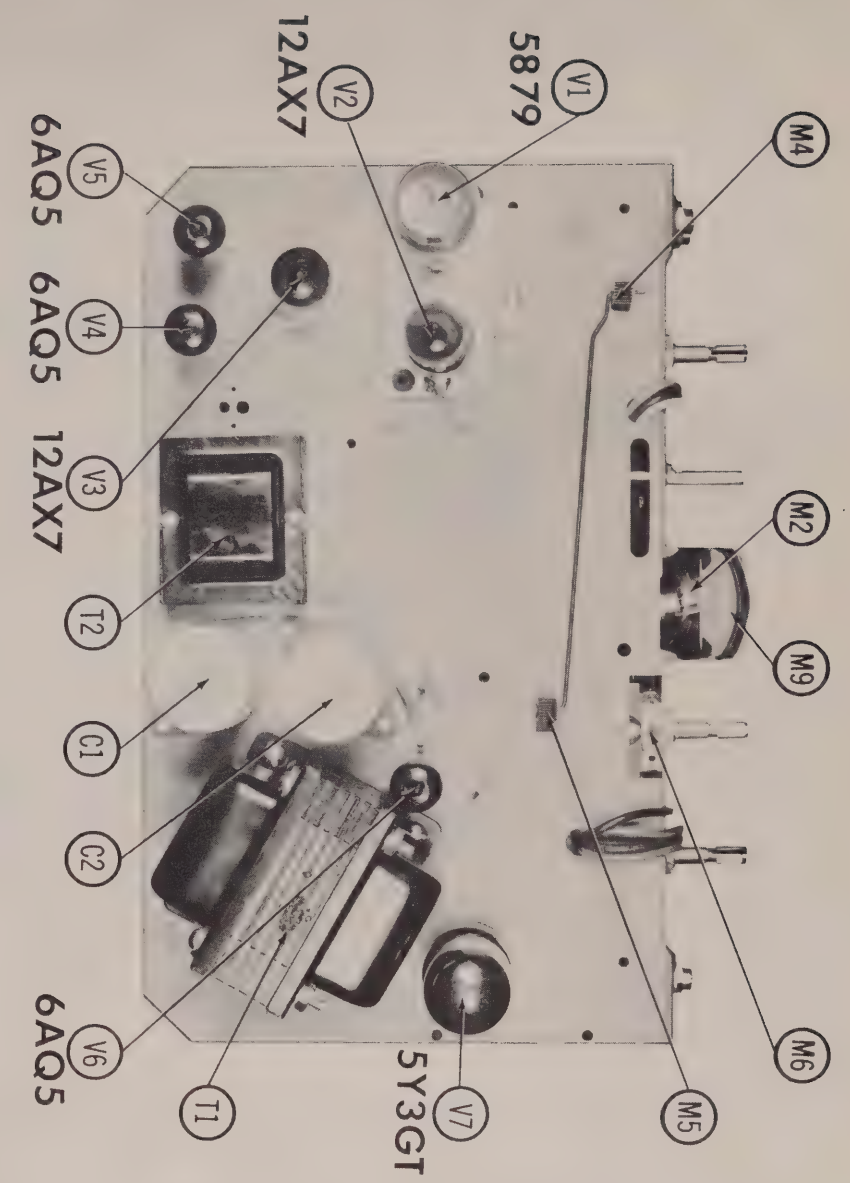
ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA EKOTAPE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES	
C4	200		S6065-3						N470	10%
C5	.1	400	S3595	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1		
C6	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47		
C7	.005	600	S4512	P688N-005	D6-502	CUB6D5	GEM-625	6TM-D5		
C8	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47		
C9	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47		
C10	.002	600	S4510	P688N-002	D6-202	CUB6D2	GEM-622	6TM-D2		
C11	.05	200	211-14912	P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5		
C12	3000		211-19827				MCE461			2%
C13	300		211-19833				MCE241			2%
C14	.025	400	S4282	P488N-025			GEM-4125	4TM-S25		
C15	.025	400	S4282	P488N-025			GEM-4125	4TM-S25		
C16	100		S6065-2	NPO-SI 100	TCZ-100	CTA6T1C	ZT-531	5TCC-T1	NPO	10%
C17	.047	400	211-15048	P488N-047	DF-503	CUB4S47	CUB4S47	4TM-S47		
C18	1000		241-24921							10%
C19	50		S-6065-11	NPO-SI50	D6-500	CTA6Q51C	ZT-545	5TCC-Q5		10%
C20	50		S-6065-11	NPO-SI50	D6-500	CTA6Q51C	ZT-545	5TCC-Q5		10%
C21	3000		241-14260-1	SI3000	D6-302	LT6D3	UC-523			
C22	1700		241-14260-2							10%
C23	3000		241-14260-1	SI3000	D6-302	LT6D3	UC-523			
C24	.75	50	241-24397-1							
C25	.1	400	211-13083	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1		

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA EKOTAPE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES	
R1A	500K	½	241-17940-2	B-60	A47-500K-Z	Q13-133	U48	Volume	
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.		
R2A	250K-100K	½	241-17941-2					Tone	Note 1
B	Switch								

Note 1. Element is open making ranges of 250K and 100K.

CHASSIS—TOP VIEW



MAIN AMP PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	EKOTAPE PART No.	NOTES
R3	510K 5%		29501-53	
R4	1000Ω		29501-11	
R5	1meg		29501-57	
R6	150K		29501-44	
R7	510K 5%		29501-53	
R8	10K		29501-24	
R9	22K		29501-29	
R10	2000Ω 5%		29501-14	
R11	100K		29501-41	
R12	180K 5%		29501-46	
R13	240K 5%		29501-48	
R14	2000Ω 5%		29501-14	
R15	100K		29501-41	
R16	100K		29501-41	
R17	100K		29501-41	
R18	5100Ω 5%		29501-21	
R19	1meg		29501-57	
R20	150K		29501-44	
R21	390K		29501-113	
R22	5100Ω 5%	1	29501-75	
R23	2400Ω 5%		29501-15	
R24	2000Ω 5%		29501-14	
R25	240K 5%		29501-48	
R26	240K 5%		29501-48	
R27	360K 5%		29501-50	
R28	12K 5%		29501-25	
R29	360K 5%		29501-50	
R30	240Ω 5%	2	29501-90	
R31	30K 5%		29501-32	
R32	270K		29501-106	
R33	430Ω 5%		29501-137	
R34	8Ω	4(WW)	241-21803	
R35	10K		29501-76	
R36	130K 5%		29501-43	

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA EKOTAPE PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Bias Osc.	241-14246-1					

FILTER CHOKE

ITEM No.	RATINGS CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA EKOTAPE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L2	.080A	130Ω	5.5HY	242-21787	C5012 ①			C-1709	20C65 ①	C-14A ①

① Drill new mounting hole.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	SEC. 1	SEC. 2	SEC. 3	SEC. 4	SEC. 5	REPLACEMENT DATA EKOTAPE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .59A	540VCT @ .080A	5V @ 1.8A	6.3VCT @ 2A			242-21908	P9206			PC8404	24R13U	R-10A

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	SEC.	REPLACEMENT DATA EKOTAPE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	5500Ω CT	3-4Ω	242-21783-1	Z1011①	A-2935①	AU-609①	A-3870①	22S58 ①	S-55X ①	① Use Original Shields

SPEAKER

ITEM No.	TYPE SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA EKOTAPE PART No.	QUAM PART No.	NOTES
SP1	6"x9"	PM	3-4Ω	241-22482	69A3	
SP2	3½"	PM	14Ω	241-22481		

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA EKOTAPE PART No.	CBS PART No.	SYLVANIA PART No.	NOTES
M1	1N65	211-19988	1N65	1N65	Meter Rectifier (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	EKOTAPE PART No.	NOTES
M2	Lamp	241-22717	#1847
M3	Switch	241-17945-7	Selector (Rotary Wafer Type)
M4	Switch	241-21802-1	Speed Equalization, SPDT (Slide Type)
M5	Switch	241-21802-1	Speed Equalization, SPDT (Slide Type)
M6	Switch	241-21804	Muting
M7	Switch	241-17942-2	Speaker On-Off (Rotary Wafer Type)
M8	Switch	241-24021	Tape-Off
M9	Meter	241-24210	Record Level
M10	Head	241-24276	Record
M11	Head	242-24074	Erase, Assembly
M12	Switch	242-24018	Assembly, Includes Bracket
M13	Motor	241-20800	

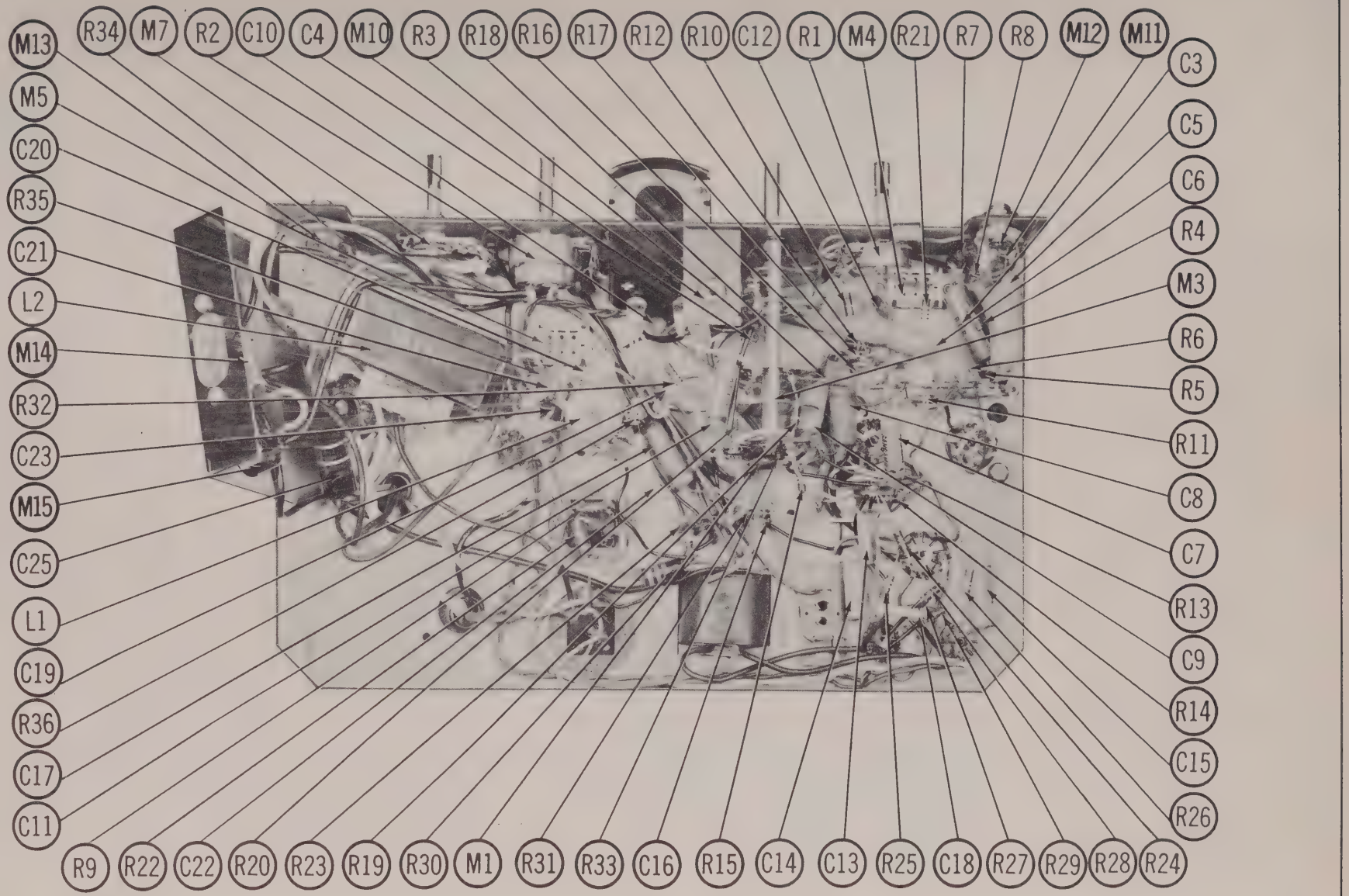
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

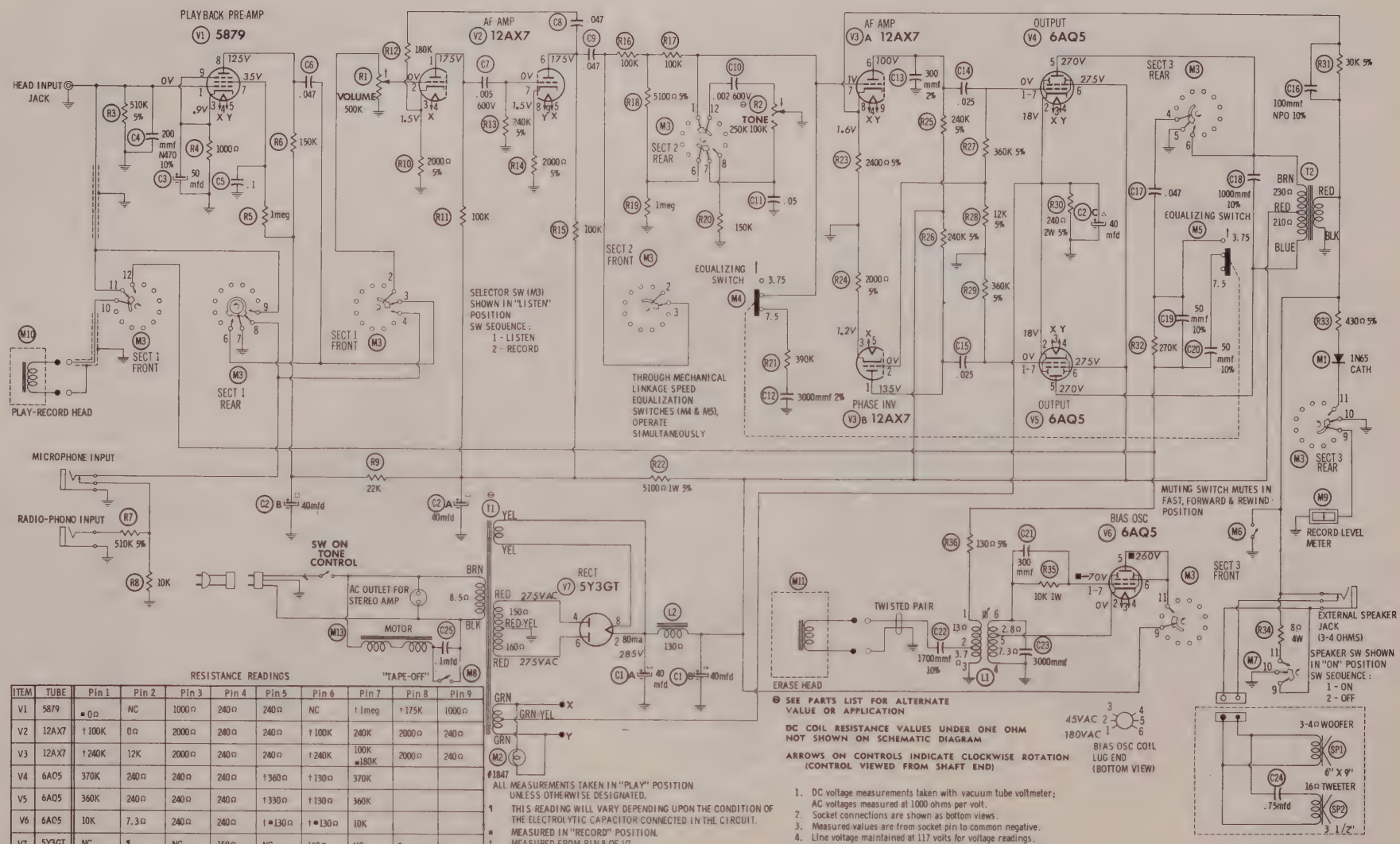
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

Low-Loss Shielded Lead (Interconnecting) .....Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)



MAIN AMP CHASSIS - BOTTOM VIEW



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	5879	▪ 0Ω	NC	1000Ω	240Ω	240Ω	NC	†1meg	†175K	1000Ω
V2	12AX7	†100K	0Ω	2000Ω	240Ω	240Ω	†100K	240K	2000Ω	240Ω
V3	12AX7	†240K	12K	2000Ω	240Ω	240Ω	†240K	100K ▪180K	2000Ω	240Ω
V4	6AQ5	370K	240Ω	240Ω	240Ω	†360Ω	†130Ω	370K		
V5	6AQ5	360K	240Ω	240Ω	240Ω	†330Ω	†130Ω	360K		
V6	6AQ5	10K	7.3Ω	240Ω	240Ω	†▪130Ω	†▪130Ω	10K		
V7	5Y3GT	NC	¶	NC	150Ω	NC	160Ω	NC	¶	

ALL MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE CIRCUIT.
▪ MEASURED IN "RECORD" POSITION.
† MEASURED FROM PIN 8 OF V7
NC NO CONNECTION.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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EKOTAPE MODEL 290

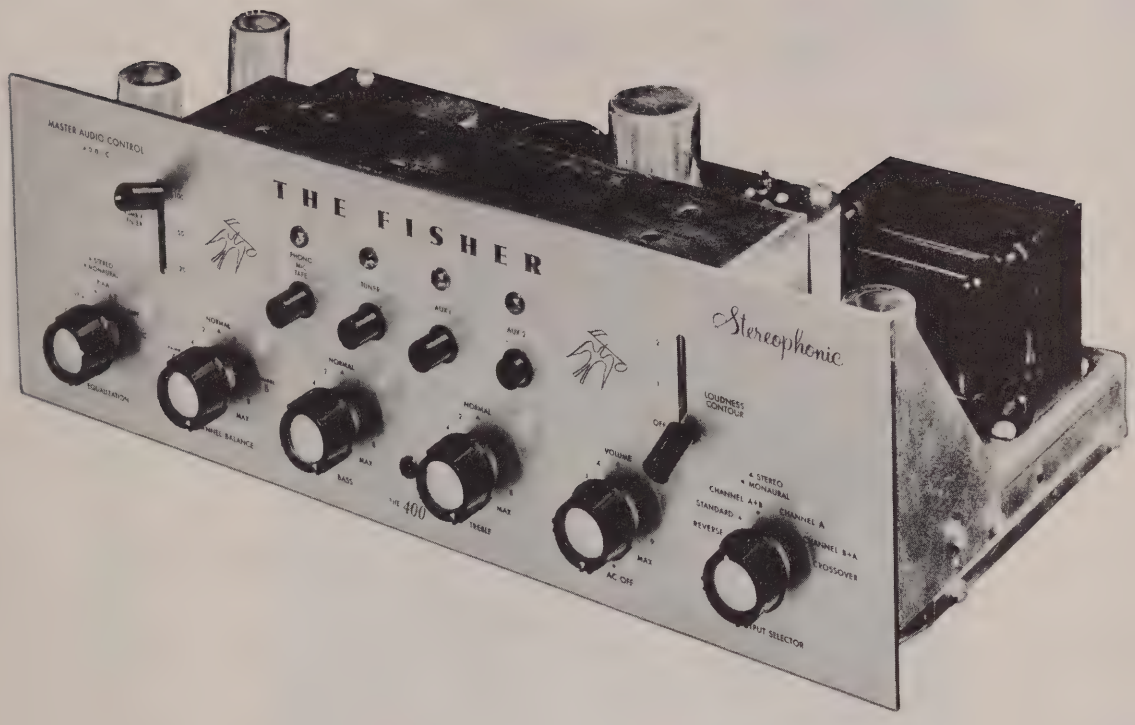
MAIN AMP SCHEMATIC

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

FISHER
MODEL 400C

FISHER
MODEL 400C



FISHER
MODEL 400C

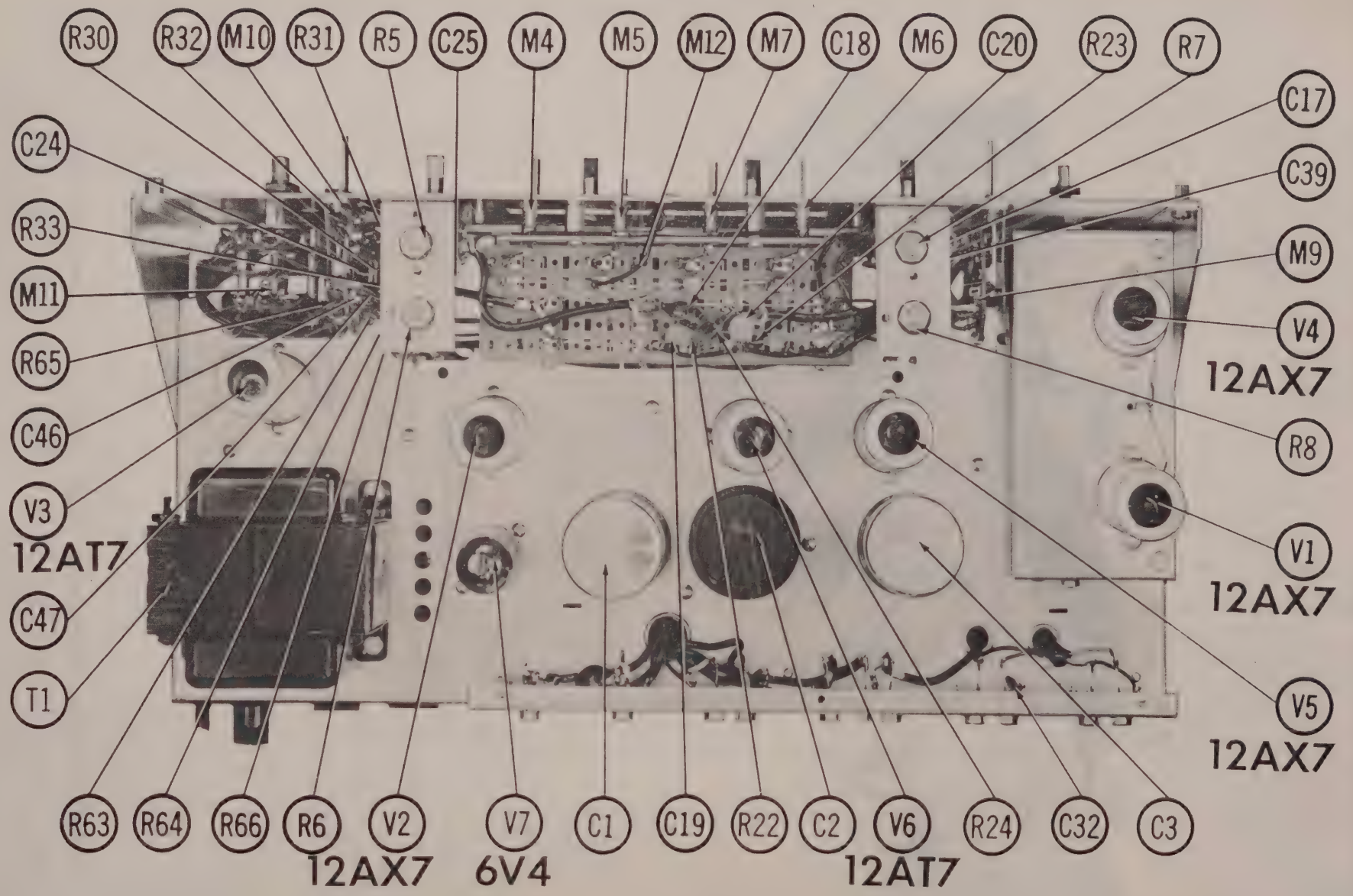
TRADE NAME	Fisher Model 400-C (Serial #10001-19999 inclusive)		
MANUFACTURER	Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y.		
TYPE SET	AC Operated Stereo Amplifier		
TUBES	Seven		
POWER SUPPLY	110-125 Volts AC, 60 Cycles	RATING	32 Watts, .30 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

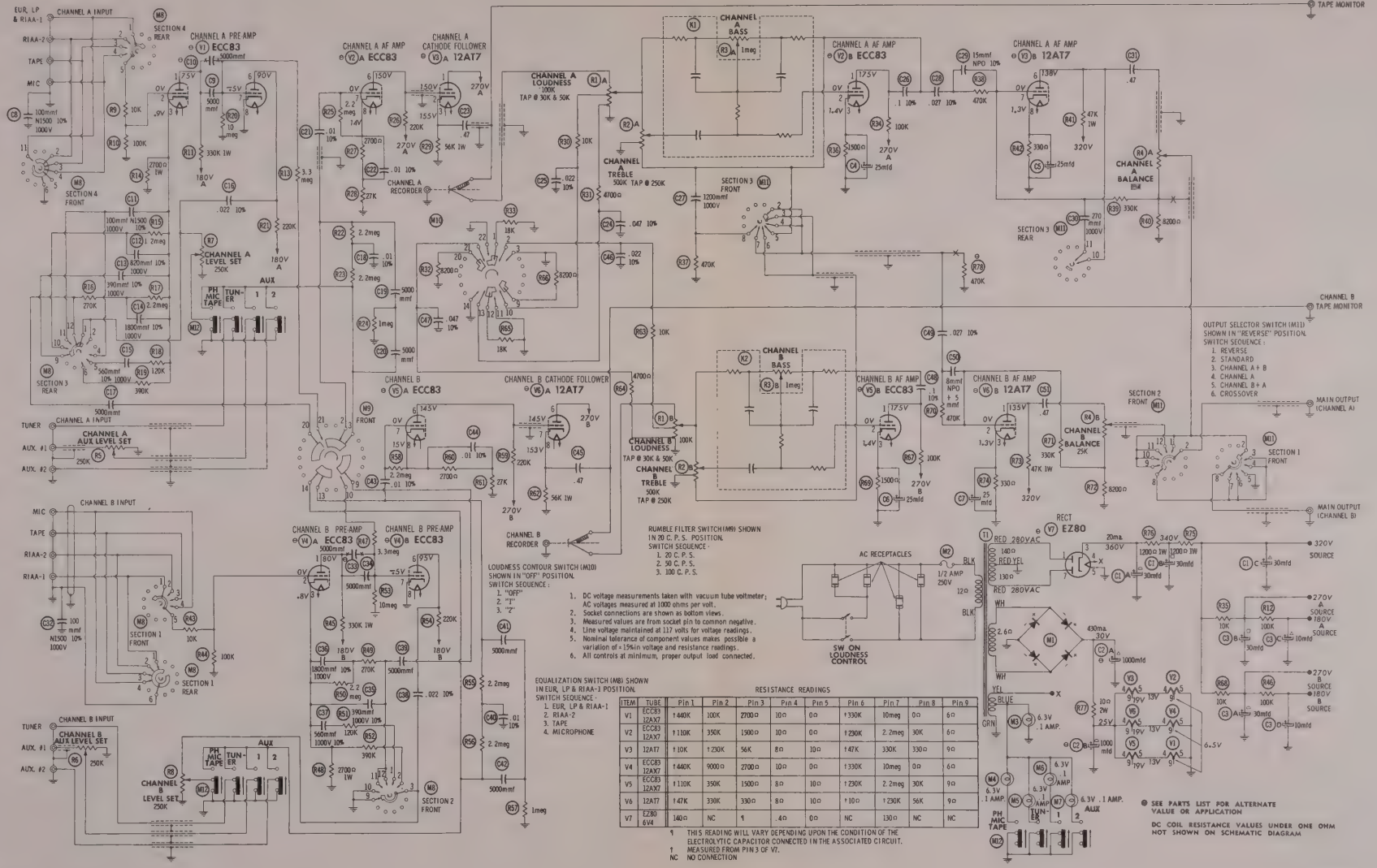
The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

H875

SET 432 FOLDER 7



CHASSIS-TOP VIEW


CHANNEL A INPUT
CHANNEL A PRE AMP ECC83
CHANNEL A AF AMP ECC83
CHANNEL A CATHODE FOLLOWER 12AT7
CHANNEL A LOUDNESS 100K TAP @ 30K & 50K
CHANNEL A TREBLE 500K TAP @ 250K
CHANNEL A BASS 1meg
CHANNEL A AF AMP ECC83
CHANNEL A AF AMP 12AT7
CHANNEL A TAPE MONITOR
CHANNEL A LEVEL SET 250K
CHANNEL A AUX LEVEL SET 250K
CHANNEL A BALANCE
CHANNEL A RECORDER
CHANNEL B
CHANNEL B CATHODE FOLLOWER 12AT7
CHANNEL B LOUDNESS 100K TAP @ 30K & 50K
CHANNEL B TREBLE 500K TAP @ 250K
CHANNEL B BASS 1meg
CHANNEL B AF AMP ECC83
CHANNEL B AF AMP 12AT7
CHANNEL B TAPE MONITOR
CHANNEL B BALANCE 25K
CHANNEL B RECORDER
CHANNEL B INPUT
CHANNEL B PRE-AMP ECC83
CHANNEL B PRE-AMP ECC83
CHANNEL B AUX LEVEL SET 250K
CHANNEL B LEVEL SET 250K
RECT EZ80
AC RECEPTACLES
SW ON LOUDNESS CONTROL
MAIN OUTPUT (CHANNEL A)
MAIN OUTPUT (CHANNEL B)
OUTPUT SELECTOR SWITCH (M11) SHOWN IN "REVERSE" POSITION. SWITCH SEQUENCE :
1. REVERSE
2. STANDARD
3. CHANNEL A + B
4. CHANNEL A
5. CHANNEL B + A
6. CROSSOVER
RUMBLE FILTER SWITCH (M9) SHOWN IN 20 C. P. S. POSITION. SWITCH SEQUENCE :
1. 20 C. P. S.
2. 50 C. P. S.
3. 100 C. P. S.
LOUDNESS CONTOUR SWITCH (M10) SHOWN IN "OFF" POSITION. SWITCH SEQUENCE :
1. "OFF"
2. "1"
3. "2"
EQUALIZATION SWITCH (M8) SHOWN IN EUR, LP & RIAA-1 POSITION. SWITCH SEQUENCE :
1. EUR, LP & RIAA-1
2. RIAA-2
3. TAPE
4. MICROPHONE
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.
RESISTANCE READINGS
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	ECC83 / 12AX7	↑440K	100K	2700Ω	10Ω	0Ω	↑330K	10meg	0Ω	6Ω
V2	ECC83 / 12AX7	↑110K	350K	1500Ω	10Ω	0Ω	↑230K	2.2meg	30K	6Ω
V3	12AT7	↑10K	↑230K	56K	8Ω	10Ω	↑47K	330K	330Ω	9Ω
V4	ECC83 / 12AX7	↑440K	9000Ω	2700Ω	10Ω	0Ω	↑330K	10meg	0Ω	6Ω
V5	ECC83 / 12AX7	↑110K	350K	1500Ω	8Ω	10Ω	↑230K	2.2meg	30K	9Ω
V6	12AT7	↑47K	330K	330Ω	8Ω	10Ω	↑10Ω	↑230K	56K	9Ω
V7	EZ80 / 6V4	140Ω	NC	¶	4Ω	0Ω	NC	130Ω	NC	NC

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
↑ MEASURED FROM PIN 3 OF V7.
NC NO CONNECTION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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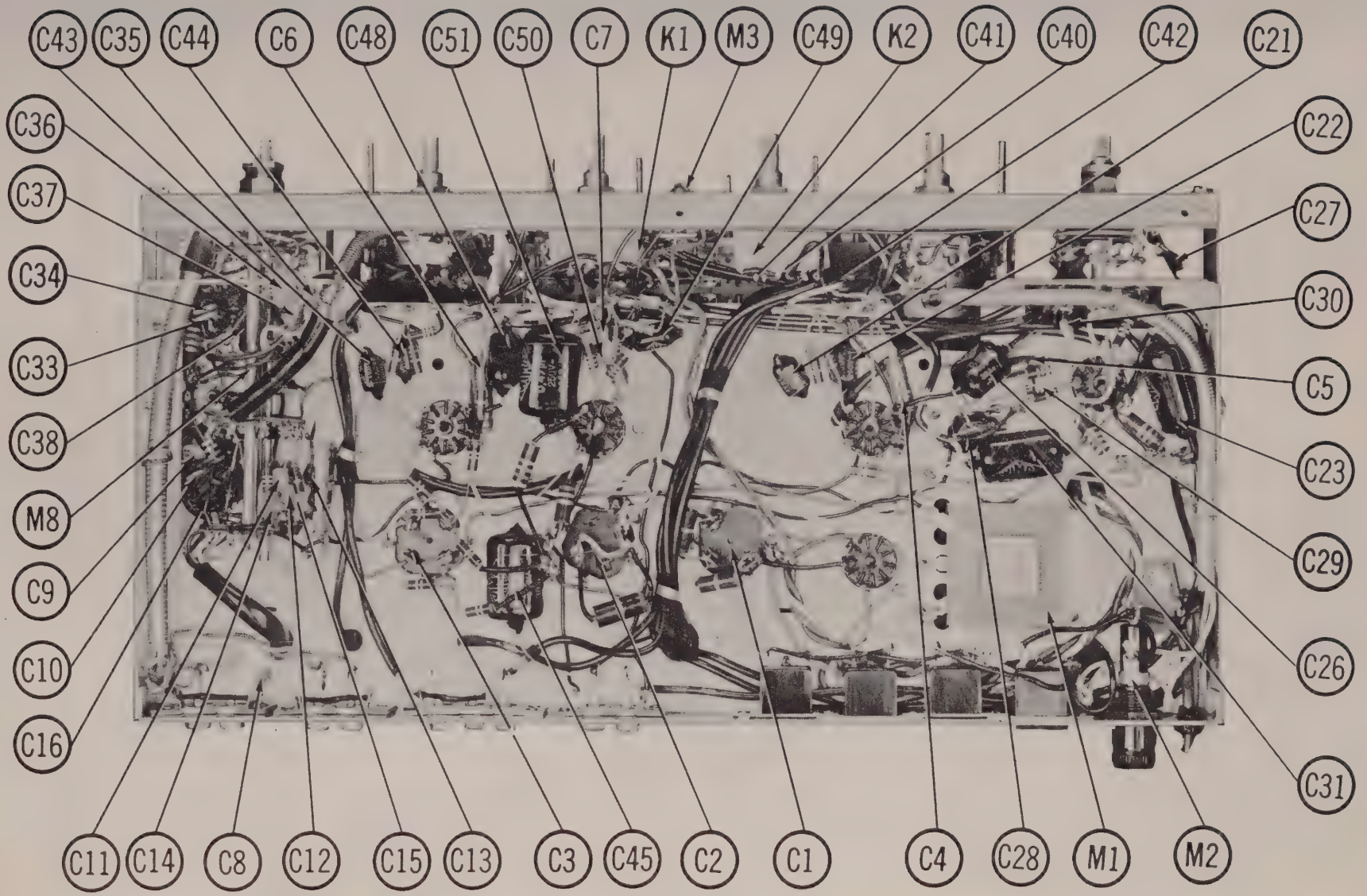
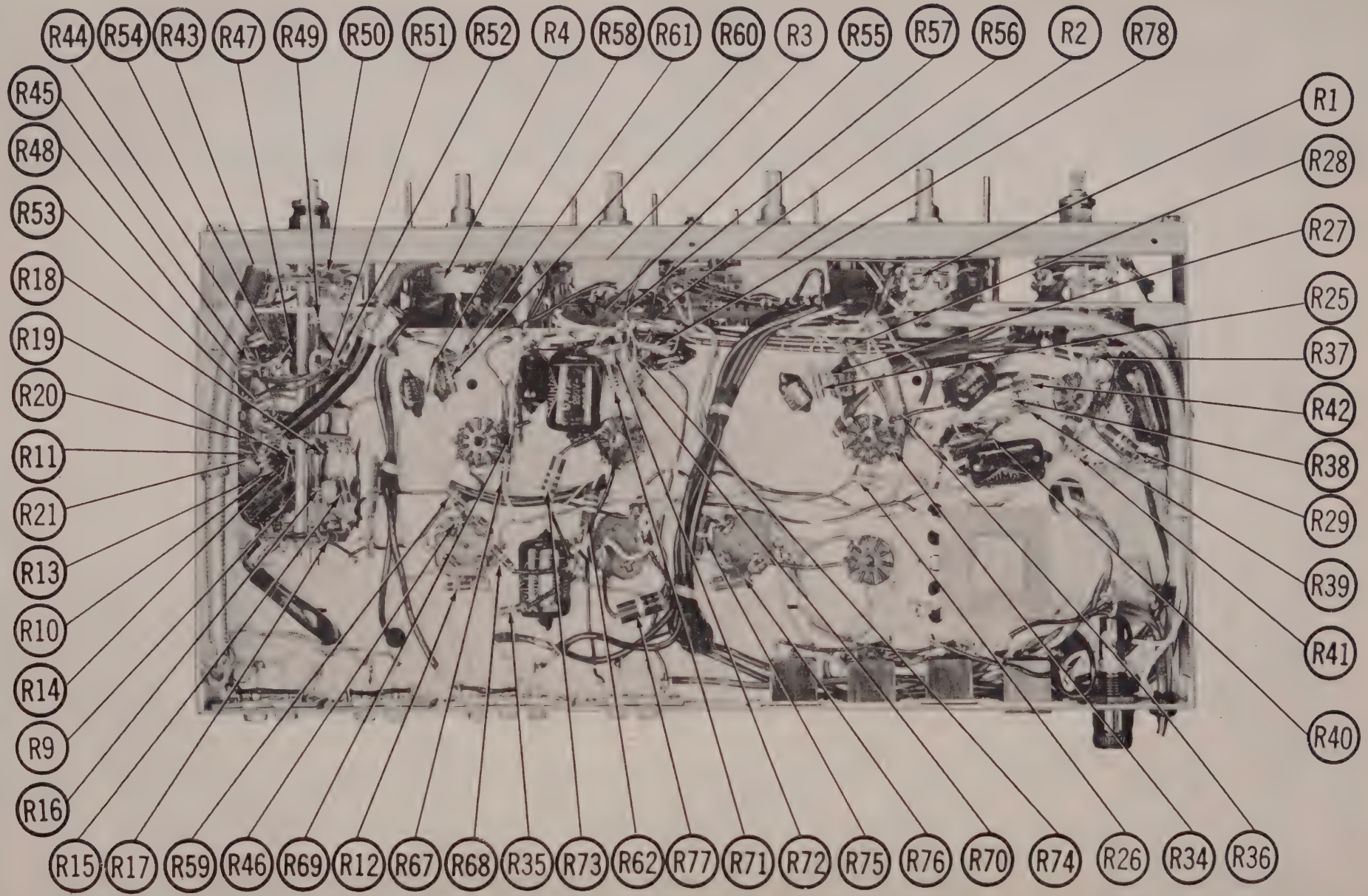
FISHER
MODEL 400C



CHASSIS BOTTOM VIEW - CAPACITOR & MISC. IDENT.



CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Ch. A Preamplifier	ECC83/12AX7 ①
V2	Ch. A AF Amplifier	ECC83/12AX7 ①
V3	Ch. A Cath. Follower - AF Amplifier	12AT7/ECC81 ①
V4	Ch. B Preamplifier	ECC83/12AX7 ①
V5	Ch. B AF Amplifier	ECC83/12AX7 ①
V6	Ch. B Cath. Follower - AF Amplifier	12AT7/ECC81 ①
V7	Rectifier	EZ80/6V4 ①

① Domestic type listed may not be directly interchangeable in some instances.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA FISHER PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲30	400	C-657-125	AFH3-39	C0300	FP376.7	TMT-46 TD-10-450	T-155	TVLS-3673.5*
B	■30	350							
C	▲30	350							
C2A	▲1000	30	C-552-106 ①						TVLS-2242 *
B	▲1000	30							
C3A	▲30	300	C-657-126	AFH4-06	D0020	FP446.6	TMQ-14	Q-035 MT-4530	TVLS-4563.5*
B	■30	300							
C	▲10	200							
D	10	200							
C4	25	6	C-639-114	SRE6V25	BBR25-6	TT6X25	TD-25-25	MMT-625	TE-1091
C5	25	6	C-639-114	SRE6V25	BBR25-6	TT6X25	TD-25-25	MMT-625	TE-1091
C6	25	6	C-639-114	SRE6V25	BBR25-6	TT6X25	TD-25-25	MMT-625	TE-1091
C7	25	6	C-639-114	SRE6V25	BBR25-6	TT6X25	TD-25-25	MMT-625	TE-1091

① Use Part #C-546-116 to replace C-552-106.
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA FISHER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C8	100	1000	C-50070-6		TCL-100				N1500 10%
C9	5000		C-50089-1	DI-5000	DD502	L10D5	B-250	5GA-D5	
C10	5000		C-50089-1	DI-5000	DD502	L10D5	B-250	5GA-D5	Note 1
C11	100	1000	C-50070-6		TCL-100				N1500 10%
C12	820	1000	C-50072-7				JL-382	10GAB-T82S 10%*	10%
C13	390	1000	C-50072-6			L10T39		10GAB-T39S 10%*	10%
C14	1800	1000	C-50072-8				JL-218	10GAB-D18S 10%*	10%
C15	560	1000	C-50072-14				JL-356	10GAB-T56S 10%*	10%
C16	.022	125	C-50074-18					2WF-S22	10%
C17	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	
C18	.01	125	C-50074-14					2WF-S10	10%
C19	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	
C20	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	
C21	.01	125	C-50074-14					2WF-S10	10%
C22	.01	125	C-50074-14					2WF-S10	10%
C23	.47	250	C-50074-29	P488N-47		CUB4P47	GEM-4047		
C24	.047	125	C-50074-19					2WF-S47	10%
C25	.022	125	C-50074-18					2WF-S22	10%
C26	.1	250	C-50074-28					5BF-P10	10%
C27	1200	1000	C-50072-4	HVD-15-1200	DD-122	L10D12	B-212	10GAB-D12	
C28	.027	125	C-50074-16					2WF-S27	10%
C29	15		CC20CJ150K5	NPO-DI 15	TCZ-15	CTA6Q18C		5TCC-Q15	NPO 10%
C30	270	1000	C-50072-16	HVD-15-270	DD-271	L10T27	B-327	10GAB-T27	
C31	.47	250	C-50074-29	P488N-47		CUB4P47	GEM-4047	4TM-P47	
C32	100	1000	C-50070-6		TCL-100				N1500 10%
C33	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	Note 1
C34	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA FISHER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C35	390	1000	C-50072-6			L10T39		10GAB-T39S 10%*	10%
C36	1800	1000	C-50072-8				JL-218	10GAB-D18S 10%*	10%
C37	560	1000	C-50072-14				JL-356	10GAB-T56S 10%*	10%
C38	.022	125	C-50074-18					2WF-S22	10%
C39	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	
C40	.01	125	C-50074-14					2WF-S10	10%
C41	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	
C42	5000		C-50089-1	DI-5000	DD-502	L10D5	B-250	5GA-D5	
C43	.01	125	C-50074-14					2WF-S10	10%
C44	.01	125	C-50074-14					2WF-S10	10%
C45	.47	125	C-50074-29	P288N-47		CUB4P47	GEM-4047	2WF-P47	
C46	.022	125	C-50074-18					2WF-S22	10%
C47	.047	125	C-50074-19					2WF-S47	10%
C48	.1	250	C-50074-28					5BF-P10	10%
C49	.027	125	C-50074-16					2WF-S27	10%
C50	8		CC20CJ080D5						NPO ± .5mmf
C51	.47	250	C-50074-29	P488N-47		CUB4P47	GEM-4047	4TM-P47	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.
Note 1. Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA FISHER PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	100K	½	R657-137					Volume, Tap ② 30K & 50K Ch. A
B	100K	½						Volume, Tap ② 30K & 50K Ch. B
C	Switch							
R2A	500K	½	R657-133					Treble, Tap ② 250K Chan. A
B	500K	½						Treble, Tap ② 250K Chan. B
R3A	1meg	½	R657-136	BB-108	AD47-1meg-S	Q13-137		Bass, Chan. A
B	1meg	½		Not Req.	Not Req.	M11-137		Bass, Chan. B
C	Shaft			Not Req.	FS-3	Not Req.		
R4A	25K	½	R657-135			Q11-120		Balance, Chan. A
B	25K	½				M11-120		Balance, Chan. B
R5	250K	½	R657-134	JP-254	48M-250K-S			Level Set Aux. Chan. A
R6	250K	½	R657-134	JP-254	48M-250K-S			Level Set Aux. Chan. B
R7	250K	½	R657-134	JP-254	48M-250K-S			Level Set, Chan. A
R8	250K	½	R657-134	JP-254	48M-250K-S			Level Set, Chan. B

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	FISHER PART No.	NOTES
R9	10K		RC20BF103K	
R10	100K		RC20BF104K	
R11	330K	1	RC30BF334K	
R12	100K		RC20BF104K	
R13	3.3meg		RC20BF335K	
R14	2700Ω	1	RC30BF272K	
R15	1.2meg		RC20BF125K	
R16	270K		RC20BF274K	
R17	2.2meg		RC20BF225K	
R18	120K		RC20BF124K	
R19	390K		RC20BF394K	
R20	10meg		RC20BF106K	
R21	220K		RC20BF224K	
R22	2.2meg		RC20BF225K	
R23	2.2meg		RC20BF225K	
R24	1meg		RC20BF105K	
R25	2.2meg		RC20BF225K	
R26	220K		RC20BF224K	
R27	2700Ω		RC20BF272K	
R28	27K		RC20BF273K	
R29	56K	1	RC30BF563K	
R30	10K		RC20BF103K	
R31	4700Ω		RC20BF472K	
R32	8200Ω		RC20BF822K	
R33	18K		RC20BF183K	
R34	100K		RC20BF104K	
R35	10K		RC20BF103K	
R36	1500Ω		RC20BF152K	
R37	470K		RC20BF474K	
R38	470K		RC20BF474K	
R39	330K		RC20BF334K	
R40	8200Ω		RC20BF822K	
R41	47K	1	RC30BF473K	
R42	330Ω		RC20BF331K	

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	FISHER PART No.	NOTES
R43	10K		RC20BF103K	
R44	100K		RC20BF104K	
R45	330K	1	RC30BF334K	
R46	100K		RC20BF104K	
R47	3.3meg		RC20BF335K	
R48	2700Ω	1	RC30BF272K	
R49	270K		RC20BF274K	
R50	2.2meg		RC20BF225K	
R51	120K		RC20BF124K	
R52	390K		RC20BF394K	
R53	10meg		RC20BF106K	
R54	220K		RC20BF224K	
R55	2.2meg		RC20BF225K	
R56	2.2meg		RC20BF225K	
R57	1meg		RC20BF105K	
R58	2.2meg		RC20BF225K	
R59	220K		RC20BF224K	
R60	2700Ω		RC20BF272K	

ITEM No.	RATING OHMS	RATING WATT	FISHER PART No.	NOTES
R61	27K		RC20BF273K	
R62	56K	1	RC30BF563K	
R63	10K		RC20BF103K	
R64	4700Ω		RC20BF472K	
R65	18K		RC20BF183K	
R66	8200Ω		RC20BF822K	
R67	100K		RC20BF104K	
R68	10K		RC20BF103K	
R69	1500Ω		RC20BF152K	
R70	470K		RC20BF474K	
R71	330K		RC20BF334K	
R72	8200Ω		RC20BF822K	
R73	47K	1	RC30BF473K	
R74	330Ω		RC20BF331K	
R75	1200Ω	1	RC30BF122K	
R76	1200Ω	1	RC30BF122K	
R77	10Ω	2	RC40BF100K	
R78	470K		RC20BF474K	Note 1

Note 1. Not used in some versions.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA FISHER PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .30A	560VCT @ .020A	30V @ .43A	T-657-115						
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @ .6A Tap @ 5.8V @ .5A									

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	FISHER PART No.	REPLACEMENT DATA
K1	Tone Comp. (Channel A)		PC-657-140	
K2	Tone Comp. (Channel B)		PC-657-140	

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA FISHER PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M1	.430A	SR-50093	1017	C1B	604B	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA FISHER PART No. FUSE	FISHER PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M2	3AG	¼A 250V	F-3297	X-1036	312.500 (3AG ¼A 250V)	342001	AGC¼	HKP

MISCELLANEOUS

ITEM No.	PART NAME	FISHER PART No.	NOTES
M3	Lamp	1-588-120	6.3V, 0.1A
M4	Lamp	1-588-120	6.3V, 0.1A
M5	Lamp	1-588-120	6.3V, 0.1A
M6	Lamp	1-588-120	6.3V, 0.1A
M7	Lamp	1-588-120	6.3V, 0.1A
M8	Switch	S-657-131	Equalization, 6 Position, Rotary, Wafer Type
M9	Switch	S-657-132	Rumble Filter, 3 Position, Rotary, Wafer, Lever Type
M10	Switch	S-657-138	Loudness Contour, 3 Position, Rotary, Wafer, Lever Type
M11	Switch	S-657-130	Output Selector, 6 Position, Rotary, Wafer Type
M12	Switch Assembly	S-657-129	Input Channel Selector, 4 Push Type

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	E-50049-12	With Gold Triangle, 6 used
Knob	E-546-108	Pushbutton, 4 used
Knob	E-546-135	Lever, 2 used
Dress Panel	AS-657-117	
Leg	H-657-145	Plastic, 4 used

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

GROMMES
MODEL 15PG-8

GROMMES
MODEL 15PG-8

GROMMES
MODEL 15PG-8

TRADE NAME	Grommes Model 15PG-8
MANUFACTURER	Precision Electronics, Inc., 9101 King Ave., Franklin Park, Illinois
TYPE SET	AC Operated 6 Channel Audio Amplifier
TUBES	Six
POWER SUPPLY	110 - 120 Volts AC, 60 Cycles RATING 62 Watts, .66 Amp @ 117 Volts AC

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

H822

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Preamplifier	7025 ①
V2	AF Amplifier	12AX7/ ECC83
V3	AF Amp. -Phase Inv.	12AX7/ ECC83

ITEM No.	USE	TYPE
V4	Output	6973
V5	Output	6973
V6	Rectifier	6BW4/ EZ80 ②

① Some versions may use ECC83/12AX7 in this application. ② Some versions may use 6V4 in this application.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	GROMMES PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	400		AFH4-117-48	D0476				R2246*
B	■30	350			BR4045				
C	▲10	300							
D	20	25							
C2A	■10	300			B0370	FP231	TMT-88	T-378	R2740*
B	▲10	250			BBR100-15	TT15X100	TD-80-150	MTH-1510	
C	100	15							

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	GROMMES PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	100			SI100	D6-101	LT6T1	UC-531	5GA-T1	
C4	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C5	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C6	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C7	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C8	2000			BPD-002	DD-202	BYA10D2	DC522	5HK-D2	
C9	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C10	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C11	250			BPD-00025	DD-251	L10T25	UC-5325	5GA-T25	
C12	1000			BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C13	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C14	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	GROMMES PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	500K	½	MLC500K2T	BT-160		Q18-133XX	UDT283	Volume, Tap@100K & 200K
R2A	1meg	½	MTC-1M	B-69	A47-1meg-S	Q11-137	U54	Bass
B	Shaft			Not Req.	RS-2	Not Req.	Not Req.	
R3A	1meg	½	MTC-1M	B-69	A47-1meg-S	Q11-137	U54	Treble
B	Shaft			Not Req.	RS-2	Not Req.	Not Req.	

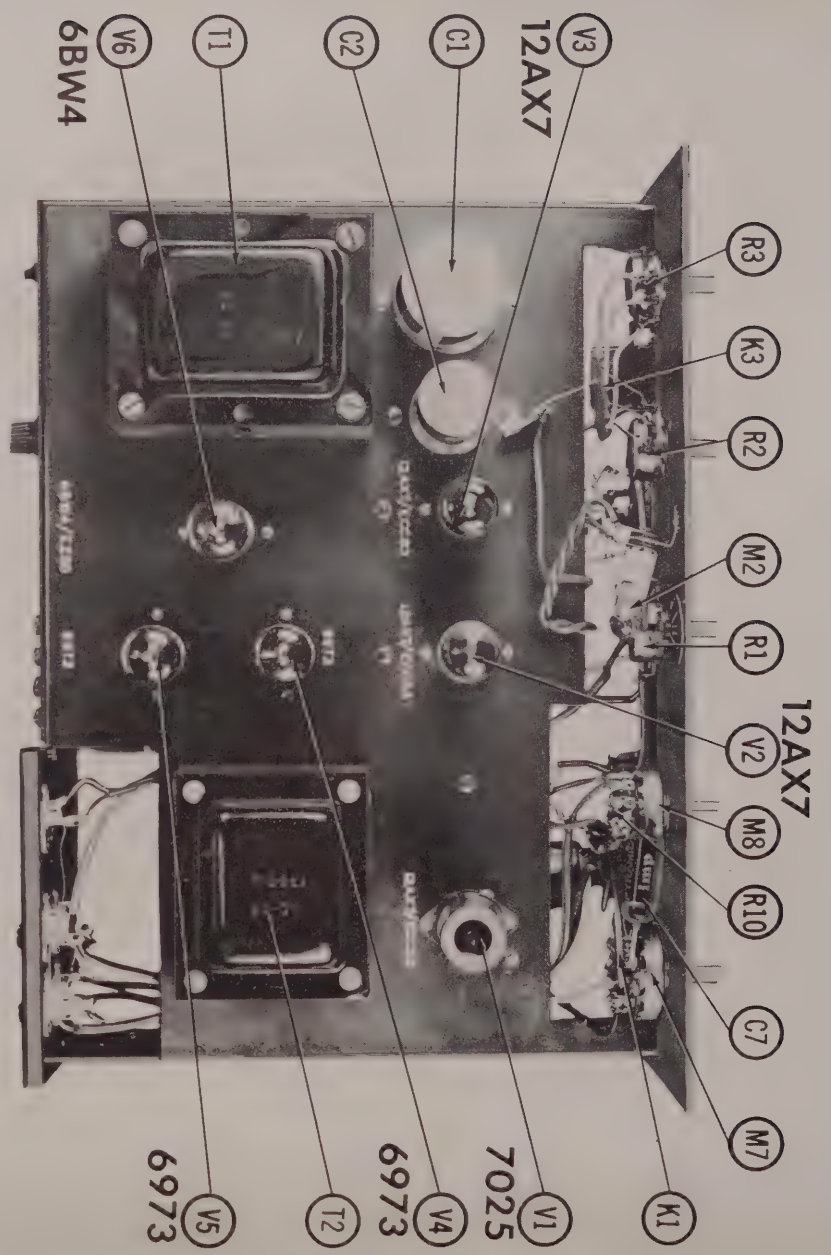
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	GROMMES PART No.	NOTES
R4	47K			
R5	100K			
R6	1000Ω			
R7	3.3meg			
R8	100K			
R9	4.7meg			
R10	47K			
R11	47K			
R12	100K			
R13	1meg			
R14	100K			
R15	100K			
R16	470Ω			
R17	22K			

ITEM No.	RATING OHMS	RATING WATT	GROMMES PART No.	NOTES
R18	100K			
R19	10K			
R20	220K			
R21	100Ω			
R22	1000Ω			
R23	47K			
R24	220K			
R25	1000Ω			
R26	220K 5%			
R27	270K 5%			
R28	300Ω	7		
R29	1000Ω			
R30	5600Ω	2		

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1.	SEC. 2	GROMMES PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .66A	660VCT @ .042A	6.3VCT @ 2.5A	TP-10	P9307	P-2957		PM8408	24R02	R-11B

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	GROMMES PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	7200Ω CT	16Ω Tap @ 8Ω, 4Ω	T0-15	Z1405 ①			A-3304 ①	22S68 ①	S-31A ①	① Use original Shields

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	GROMMES PART No.	REPLACEMENT DATA
K1	Tone Compensation Circuit	1500mmf, 800mmf, 2000mmf, 1000mmf, 100K, 3.3meg		
K2	Tone Compensation Circuit	51mmf, 10000mmf, 10000mmf, 470K, 47K, 22K		
K3	Tone Compensation Circuit	3000mmf, 3000mmf, 470mmf 68K, 68K, 68K, 10K		

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			GROMMES PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	3A 250V			312003. (3AG 3A 250V)	342001	AGC 3	HKP

MISCELLANEOUS

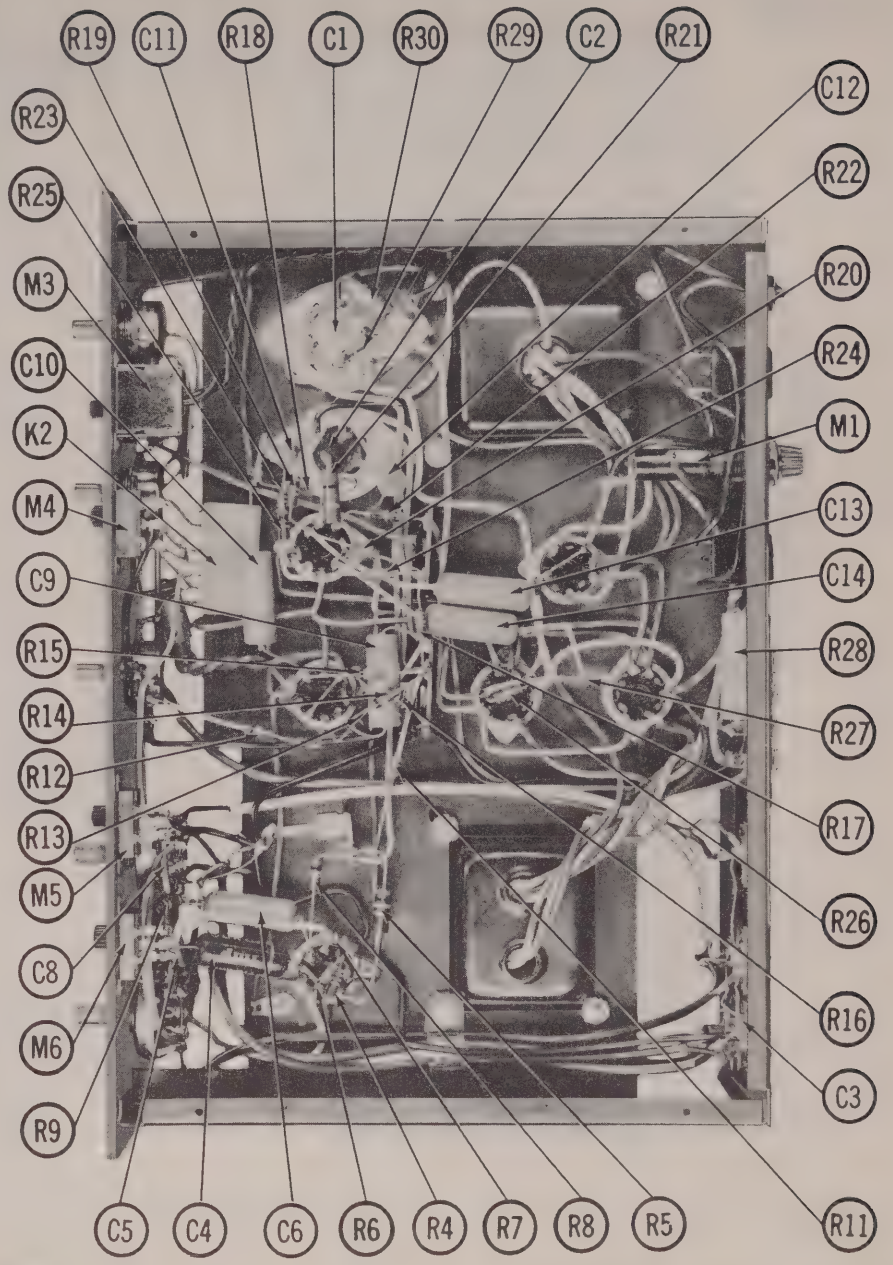
ITEM No.	PART NAME	GROMMES PART No.	NOTES
M2	Lamp		#51
M3	Switch		Power On-Off (SPST, Slide Type)
M4	Switch		Loudness On-Off (DPDT, Slide Type)
M5	Switch		Scratch Filter On-Off (SPST, Slide Type)
M6	Switch		Rumble Filter On-Off (SPDT, Slide Type)
M7	Switch		Turnover (4 Position, Rotary, Wafer Type)
M8	Switch		Input Selector (4 Position, Rotary, Wafer Type)

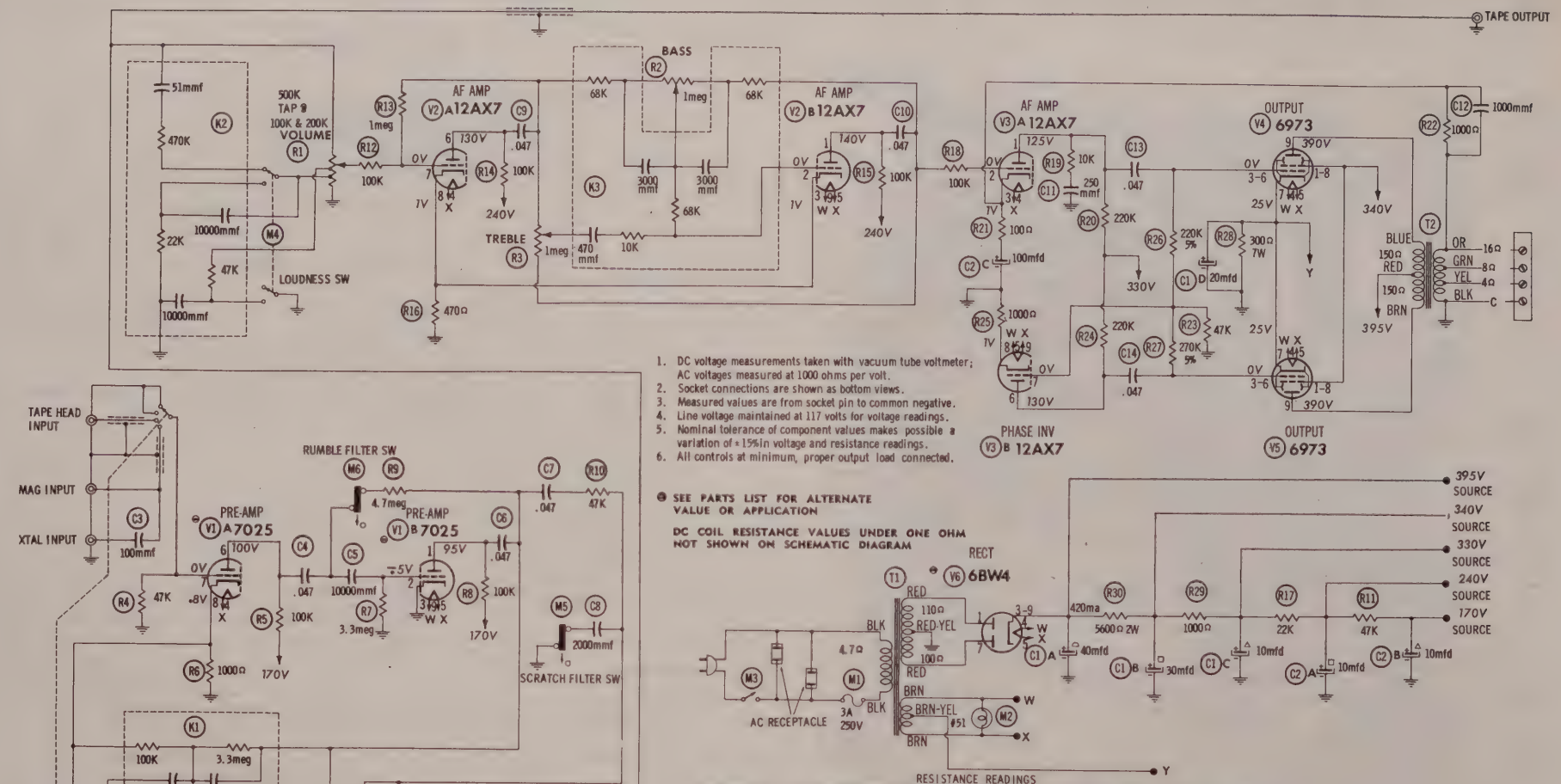
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

CHASSIS—BOTTOM VIEW





1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

SELECTOR SW (M8) SHOWN IN "AUX INPUT" POSITION.
SW SEQ.
1. -AUX
2. -TUNER
3. -TAPE HEAD
4. -PHONO (MAG OR XTAL)

†TURNOVER SW (M7) SHOWN IN "TAPE HEAD" POSITION.
SW SEQ.
1. -TAPE HEAD
2. -R1AA
3. -500
4. -500LP
5. -300

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	7025	† 175K	3.3meg	0Ω	300Ω	300Ω	† 175K	47K	1000Ω	300Ω
V2	12AX7	† 130K	1.6meg	470Ω	300Ω	300Ω	† 130K	100K	470Ω	300Ω
V3	12AX7	† 225K	1.6meg	1000Ω	300Ω	300Ω	† 220K	47K	1000Ω	300Ω
V4	6973	† 5600Ω	TP	265K	300Ω	300Ω	265K	300Ω	†5600Ω	†150Ω
V5	6973	† 5600Ω	NC	265K	300Ω	300Ω	265K	300Ω	†5600Ω	†150Ω
V6	6V4	110Ω	NC	¶	300Ω	300Ω	NC	100Ω	NC	¶

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 3 OF V6.
NC NO CONNECTION
TP TIE POINT

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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GROMMES
MODEL 15PG-8

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

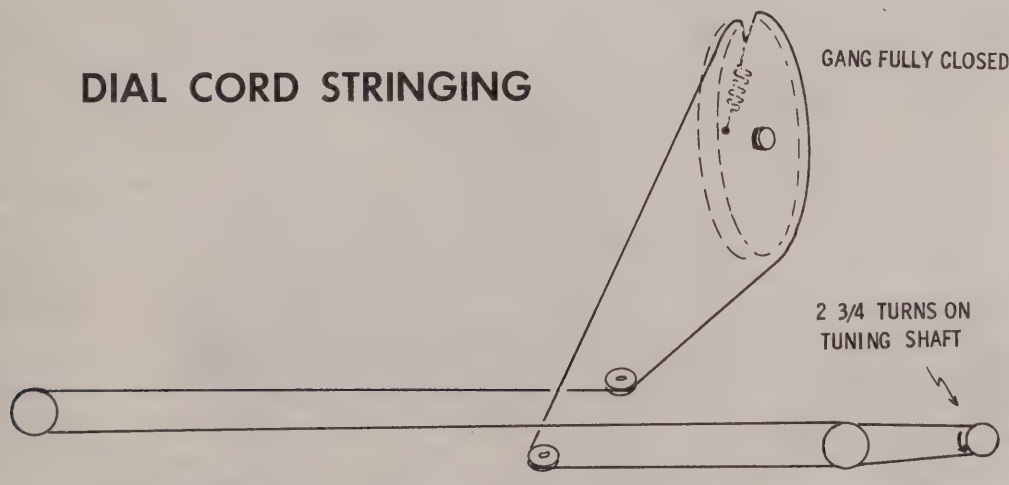
PILOT
MODEL FA-540

PILOT
MODEL FA-540

PILOT
MODEL FA-540

TRADE NAME	Pilot Model FA-540		
MANUFACTURER	Pilot Radio Corp., 37-06 36th Street, Long Island City 1, N. Y.		
TYPE SET	AC Operated FM-AM Tuner		
TUBES (Nine)	Types 6BA6 FM-AM RF Amplier, 6U8 FM-AM Mixer-FM-AM Osc., 6AB4 FM AFC, 6BA6 1st FM-AM IF Amplifier, 6AU6A 2nd FM IF Amp.-AM Det.-AVC, 6AL5 Ratio Detector 6DA5/EM81 Tuning Indicator, 12AU7 AF Amp.-Cath. Follower, 6X4 Rectifier		
POWER SUPPLY	105-120 Volts AC-60 Cycles	RATING	.38 Amp. @ 117 Volts AC (37 Watts)
TUNING RANGE - BROADCAST	540 - 1700KC	FREQ. MOD.	88 - 108MC

DIAL CORD STRINGING



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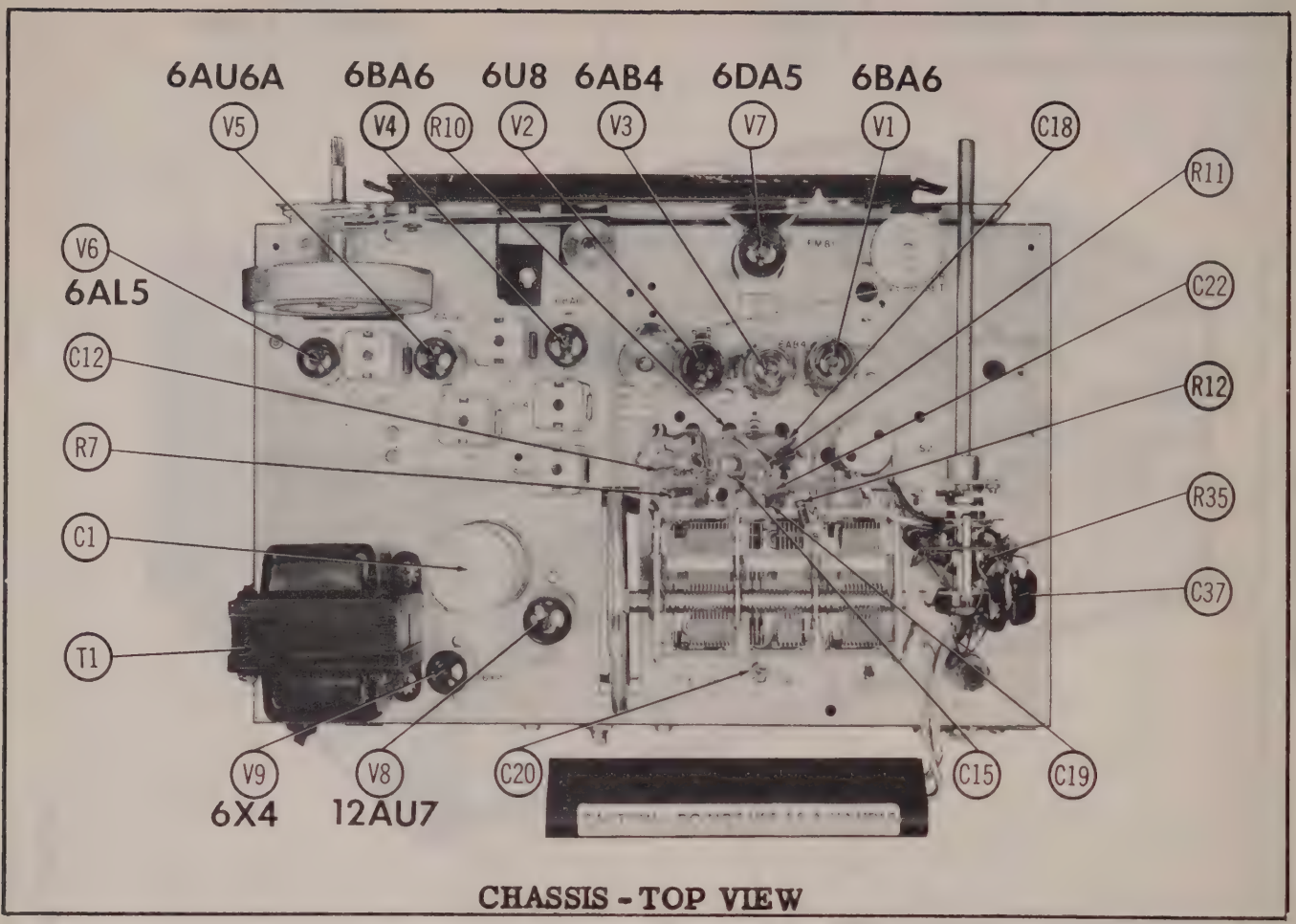
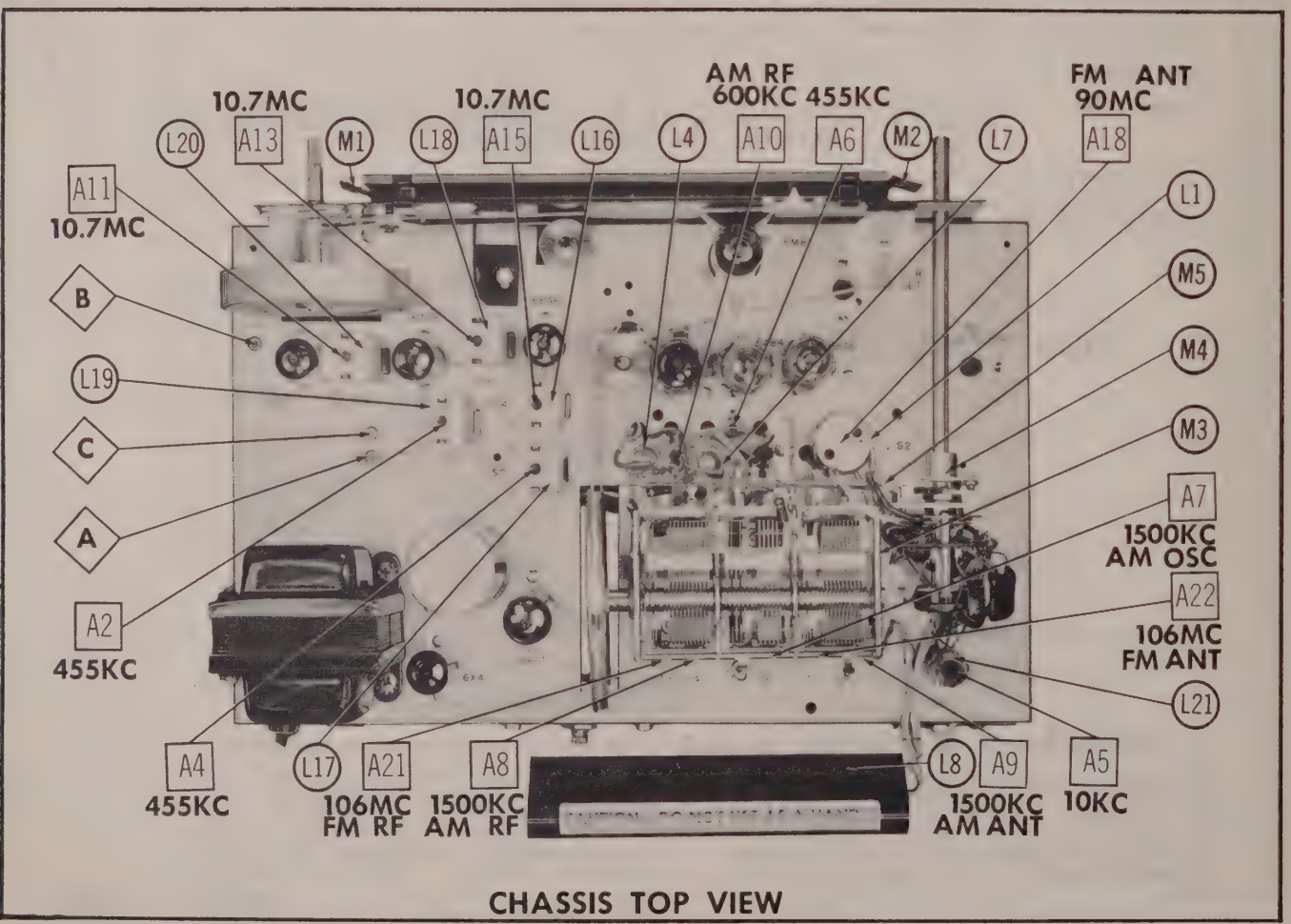
H750

DATE 2-59 SET 432 FOLDER 9

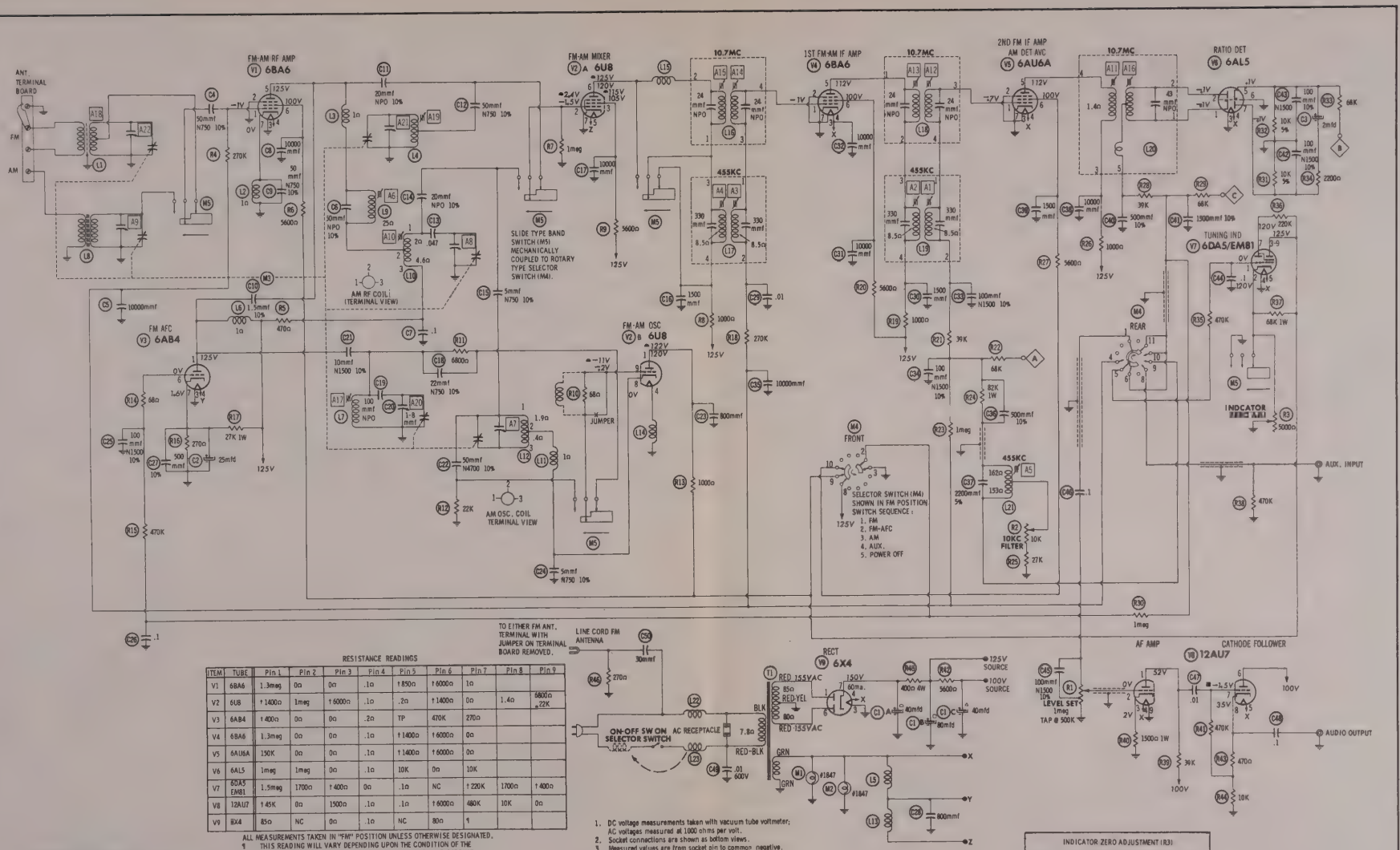
SET 432 FOLDER 9



CHASSIS - TOP VIEW



CHASSIS TOP VIEW


FM-AM RF AMP V1 6BA6
FM-AM MIXER V2A 6U8
1ST FM-AM IF AMP V4 6BA6
2ND FM IF AMP AM DET AVC V5 6AU6A
RATIO DET V6 6AL5
FM AFC V3 6AB4
FM-AM OSC V2B 6U8
TUNING IND V7 6DA5/EM81
AF AMP V8 12AU7
CATHODE FOLLOWER
RECT V9 6X4
10.7MC
455KC
ANT. TERMINAL BOARD
FM
AM
SLIDE TYPE BAND SWITCH (M5) MECHANICALLY COUPLED TO ROTARY TYPE SELECTOR SWITCH (M4).
AM RF COIL (TERMINAL VIEW)
AM OSC. COIL TERMINAL VIEW
JUMPER
SELECTOR SWITCH (M4) SHOWN IN FM POSITION. SWITCH SEQUENCE: 1. FM 2. FM-AFC 3. AM 4. AUX. 5. POWER OFF
FRONT
REAR
INDICATOR ZERO ADJ.
10KC FILTER
LEVEL SET 1meg TAP @ 500K
AUX. INPUT
AUDIO OUTPUT
TO EITHER FM ANT. TERMINAL WITH JUMPER ON TERMINAL BOARD REMOVED.
LINE CORD FM ANTENNA
ON-OFF SW ON SELECTOR SWITCH
AC RECEPTACLE
125V SOURCE
100V SOURCE

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BA6	1.3meg	0Ω	0Ω	.1Ω	↑850Ω	↑6000Ω	1Ω		
V2	6U8	↑1400Ω	1meg	↑6000Ω	.1Ω	.2Ω	↑1400Ω	0Ω	1.4Ω	6800Ω & 22K
V3	6AB4	↑400Ω	0Ω	0Ω	.2Ω	TP	470K	270Ω		
V4	6BA6	1.3meg	0Ω	0Ω	.1Ω	↑1400Ω	↑6000Ω	0Ω		
V5	6AU6A	150K	0Ω	0Ω	.1Ω	↑1400Ω	↑6000Ω	0Ω		
V6	6AL5	1meg	1meg	0Ω	.1Ω	10K	0Ω	10K		
V7	6DA5 EM81	1.5meg	1700Ω	↑400Ω	0Ω	.1Ω	NC	↑220K	1700Ω	↑400Ω
V8	12AU7	↑45K	0Ω	1500Ω	.1Ω	.1Ω	↑6000Ω	480K	10K	0Ω
V9	6X4	85Ω	NC	0Ω	.1Ω	NC	80Ω	¶		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
↑ MEASURED FROM PIN 7 OF V9.
- MEASURED IN "AM" POSITION.
• MEASURED FROM PIN 8 OF V8.
NC NO CONNECTION
TP TIE POINT

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

INDICATOR ZERO ADJUSTMENT (R3)

With tuner operating in "FM" and with the Ratio Detector (V6) removed, adjust R3 so that the edges of the shadow gap of the tuning indicator (V7) are parallel.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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PILOT
MODEL FA-540

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. To set pointer, turn tuning gang fully closed and adjust pointer to coincide with zero mark on logging scale.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.01mfd	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	455KC (400∿ Mod.)	AM	Tuning gang fully open	DC probe to point Ⓐ. Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2.	"	"	455KC (10KC Mod.)	"	"	AC probe to audio output jack. Low side to chassis.	A5, R2	Adjust for MINIMUM deflection.
3.	"	High side to AM antenna terminal. Low side to chassis.	455KC (400∿ Mod.)	"	"	DC probe to point Ⓐ. Common to chassis.	A6	Adjust for MINIMUM deflection.
4.	"	"	1500KC	"	1500KC	"	A7, A8, A9	Adjust for maximum deflection.
5.	"	"	600KC	"	600KC	"	A10	Adjust for maximum deflection while rocking tuning gang. Repeat step 5.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6.	200mmf	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe to point Ⓑ. Common to chassis.	A11, A12, A13, A14, A15	Adjust for maximum deflection.
7.	"	"	"	"	"	DC probe to point Ⓒ. Common to chassis.	A16	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.								
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
6.	200mmf	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point Ⓑ. Low side to chassis.	A11, A12, A13, A14, A15	Disconnect stabilizing capacitor C3. Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7.	"	"	"	"	"	Vert. Amp. to point Ⓒ. Low side to chassis.	A16	Reconnect stabilizing capacitor C3. Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A12 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
8.	270Ω Carbon Resistor	High side to FM antenna terminal. Low side to chassis.	90MC (Unmod.)	FM	90MC	DC probe to point Ⓑ. Common to chassis.	A17, A18, A19	Adjust for maximum deflection.
9.	"	"	106MC	"	106MC	"	A20, A21, A22	"

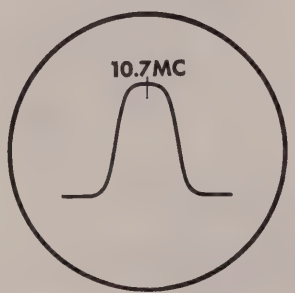


FIG. 1

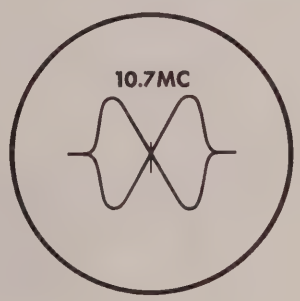
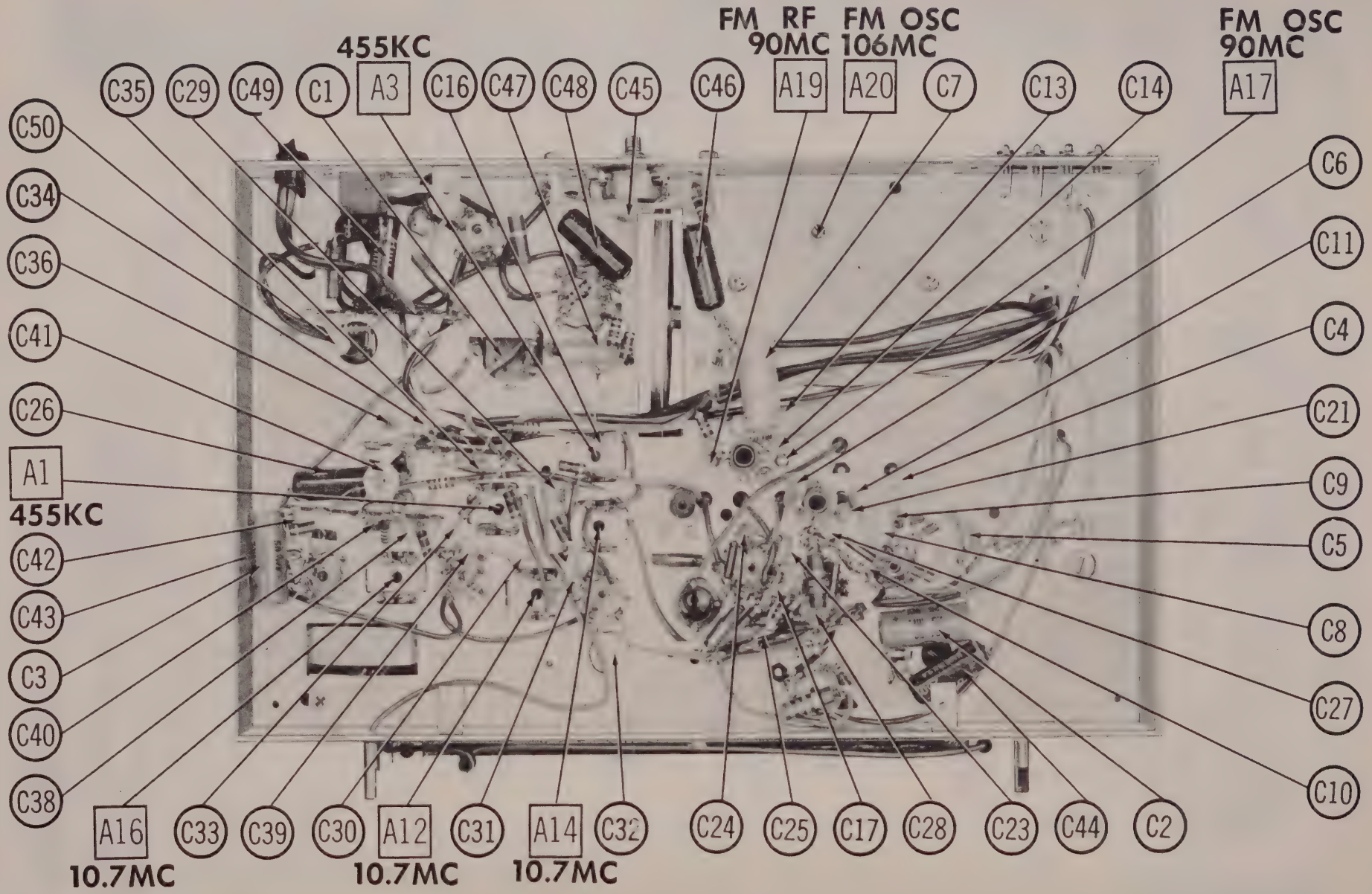


FIG. 2



CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM-AM RF Amplifier	6BA6	
V2	FM-AM Mixer - FM-AM Osc.	6U8	
V3	FM AFC	6AB4	
V4	1st FM-AM IF Amplifier	6BA6	
V5	2nd FM IF Amp. - AM Det. - AVC	6AU6A	
V6	Ratio Detector	6AL5	
V7	Tuning Indicator	6DA5/EM81	
V8	AF Amp. - Cath. Follower	12AU7	
V9	Rectifier	6X4	

ELECTROLYTIC CAPACITORS

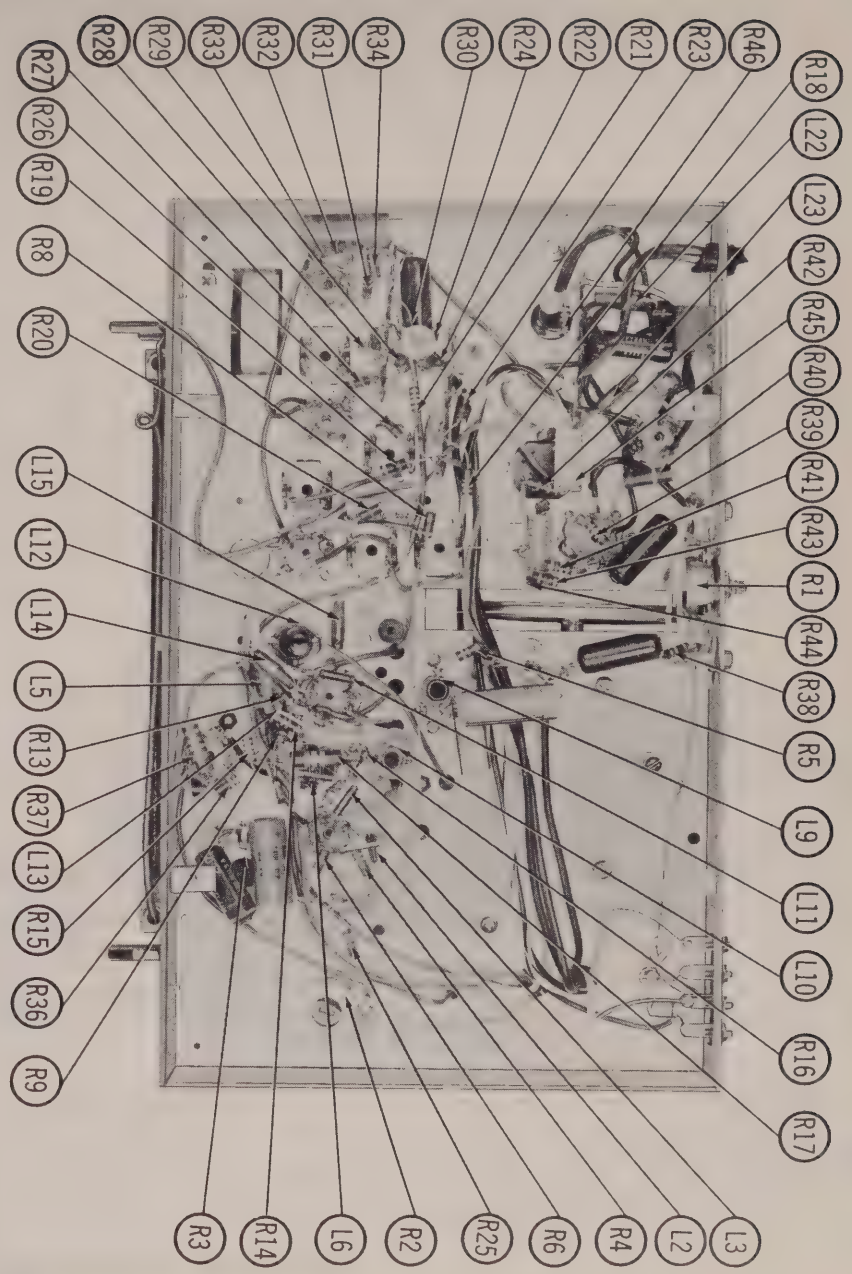
ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA PILOT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	300	24-123		D0022	FP433.4	TMT-29	T-111	TVL-3561.5
B	■80	250			BR3035	TC68	TD-40-350	MT-4520	
C	▲40	250							
C2	25	25	24-50	PRS25V25	BBR25-25	TC36	TD-25-25	MT-0225	TVA-1205
C3	2	50	24-82	PRS50V2	BBR2-50	TT150X2	TD-2-50	MT-0502	TVA-1301

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PILOT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	50					C10Q5U			N750 10%
C5	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C6	50			NPO-DI 50	DTZ-50	C10Q5C	ZT-545		NPO 10%
C7	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C8	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C9	50					C10Q5U			N750 10%
C10	1.5			NPO-SI 1.5	TCZ-1R5	CTA6V15C	ZT-5515	5TCUB-V15	10%
C11	20			NPO-DI 20	DTZ-20	C10Q2C	ZT-542	5TCC-Q2	NPO 10%
C12	50					C10Q5U			N750 10%
C13	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C14	20			NPO-DI 20	DTZ-20	C10Q2C	ZT-542	5TCC-Q2	NPO 10%
C15	5				DTN-5	C10V5U	NT-555	5TCUB-V5	N750 10%
C16	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C17	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C18	22			N750-DI 22	DTN-22	C10Q22U		5TCU-Q22	N750 10%
C19	100			NPO-SI 100	DTZ-100	C10T1C	ZT-531	5TCC-T1	NPO
C20	1-8								
C21	10								N1500 10%
C22	50								N4700 10%
C23	800			BPD-0008	DD-801	L10T8		5GA-T8	
C24	5				DTN-5	C10V5U	NT-555	5TCUB-V5	N750 10%
C25	100								N1500 10%
C26	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C27	500				MD-501				10%
C28	800			BPD-0008	DD-801	L10T8		5GA-T8	
C29	.01	400		P488N-01	D6-103	CUB4S1	GEM-411	4TM-S1	
C30	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C31	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C32	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C33	100								N1500 10%
C34	100								N1500 10%
C35	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C36	500				MD-501				10%
C37	2200			1464-0022		1R5D22		MS-222	5%
C38	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C39	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C40	500				MD-501				10%
C41	1500								10%
C42	100								N1500 10%
C43	100								N1500 10%
C44	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C45	100								N1500 10%
C46	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C47	.01	400		P488N-01	D6-103	CUB4S1	GEM-411	4TM-S1	
C48	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C49	.01	600		P688N-1	D6-103	CUB6S1	GEM-611	6TM-S1	
C50	30	2000		HVD-30-33	DD30-300	HVA20Q33	DC30433	20GA-Q33	

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PILOT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1meg	½	39-41	ABT-74	A47F5-1meg	Q19-137X	UT-443	Level Set, Tap @ 500K
B	Shaft			AK-1	FKS-1/4	Not Req.	Not Req.	
R2A	10K	½	39-46	AB-14	B47-10K-S	B11-116	TA14L	10KC Filter
B	Shaft			AK-1	Not Req.	SK2	Not Req.	
R3A	5000Ω	½	39-42	AB-10	B47-5000-S	Q11-114	TA53L	Indicator Zero Set
B	Shaft			AK-1	Not Req.	RQ	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		PILOT PART No.	NOTES
	OHMS	WATT		
R4	270K			
R5	470Ω			
R6	5600Ω			
R7	1meg			
R8	1000Ω			
R9	5600Ω			
R10	68Ω			
R11	6800Ω			
R12	22K			
R13	1000Ω			
R14	68Ω			
R15	470K			
R16	270Ω			
R17	27K	1		
R18	270K			
R19	1000Ω			
R20	5600Ω			
R21	39K			
R22	68K			
R23	1meg			
R24	82K	1		
R25	27K			

ITEM No.	RATING		PILOT PART No.	NOTES
	OHMS	WATT		
R26	1000Ω			
R27	5600Ω			
R28	39K			
R29	68K			
R30	1meg			
R31	10K 5%			
R32	10K 5%			
R33	68K			
R34	2200Ω			
R35	470K			
R36	220K			
R37	68K	1		
R38	470K			
R39	39K			
R40	1500Ω	1		
R41	470K			
R42	5600Ω			
R43	470Ω			
R44	10K			
R45	400Ω	4	31-145	
R46	270Ω			

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		PILOT PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Coil						
L2	RF Choke	75-33	19-1004	SW-631	4529		5 Microhenries
L3	RF Choke	75-33	19-1004	SW-631	4529		5 Microhenries
L4	FM RF Coil	71-42					
L5	Fil. Choke	75-19	19-1001	BC-562	4604		1.5 Microhenries
L6	RF Choke	75-33	19-1004	SW-631	4529		5 Microhenries
L7	FM Osc. Coil	72-77					
L8	Loop Stick	270-54					181 Microhenries
L9	455KC Trap	79-102					2.37 Millihenries
L10	AM RF Coil	71-43					184 Microhenries
L11	RF Choke	75-33	19-1004	SW-631	4529		5 Microhenries
L12	AM Osc. Coil	72-76					141 Microhenries
L13	Fil. Choke	75-19	19-1001	BC-562	4604		1.5 Microhenries
L14	Fil. Choke	75-19	19-1001	BC-562	4604		1.5 Microhenries
L15	RF Choke	75-19	19-1001	BC-562	4604		1.5 Microhenries
L16	1st FM IF	273-151	16-3487	FM-254	1463		
L17	1st AM IF	273-129	16-6758	BC-352	12-C1	RF-1	
L18	2nd FM IF	273-151	16-3487	FM-254	1463		
L19	2nd AM IF	273-129	16-6758	BC-353	12-C2	RF-2	
L20	Ratio Detector	279-72	17-3498	FM-255	1465		
L21	10KC Filter Choke	79-106					120 Millihenries
L22	Line Filter Choke	75-19	19-1001	BC-562	4604		1.5 Microhenries
L23	Line Filter Choke	75-19	19-1001	BC-562	4604		1.5 Microhenries

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	PILOT PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .38A	300VCT @ .060A	6.3V @ 3.05A	55-39						

MISCELLANEOUS

ITEM No.	PART NAME	PILOT PART No.	NOTES
M1	Lamp	68-10	#1847
M2	Lamp	68-10	#1847
M3	Tuning Cap.	26-61	AM-FM, 6 Gang (AM Sections: Ant. 27-501mmf, RF 24-494mmf, Osc. 29-183mmf)
M4	Switch	100-113	Selector, Rotary, Wafer Type
M5	Switch	101-43	Band, 5P3T, Slide Type (Mechanically coupled to M4).

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

PHOTOFACT* Folder

ROLAND MODELS
71-485 (7TL), 71-486 (7TW)

MODEL 71-486

ROLAND MODELS
71-485 (7TL), 71-486 (7TW)

TRADE NAME	Roland Models 71-485 (7TL), 71-486 (7TW)
MANUFACTURER	Roland Radio Corp., 12-30 Anderson Ave., Mount Vernon, N. Y.
TYPE SET	Battery Operated Portable Transistorized AM Receiver
POWER SUPPLY	9 Volts DC
TUNING RANGE—BROADCAST	540-1600 KC
RATING	9.2 MA @ 9 Volts DC (No Signal, Min. Volume) 12 MA @ 9 Volts DC (Signal, Normal Volume)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.		Loop	455KC (400~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
2.		"	1600KC	1600KC	"	A5	"
3.		"	600KC	600KC	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output while rocking tuning gang thru 600KC signal.
4.		"	1400KC	Tune to 1400KC signal	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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SET 432 FOLDER 10

PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N411	Mixer		2N411	2N486	2N411	PNP Note 1
X2	2N411	Osc.		2N411	2N485	2N411	PNP Note 2
X3	GT759R	1st IF		2N409	2N483	2N34	PNP Note 3
X4	2N409	2nd IF		2N409	2N483	2N409	PNP Note 4
X5	2N406	Driver		2N406	2N362	2N406	PNP Note 5
X6	2N408	Output		2N408	2N632	2N408	PNP Note 5
X7	2N408	Output		2N408	2N632	2N408	PNP Note 5

Note 1. Alternate type GT761R
Note 2. Alternate type GT760R
Note 3. Alternate type GT759
Note 4. Alternate type GT760
Note 5. Alternate type GT20

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	ROLAND PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	100	12	581014	SRE12V100	NL100-10	TT15X100	ML100-15		TE-1135
C2	10	25		XPP-25010	NL10-15	TT50X10	ML10-15		TE-1204
C3	8	12	①	XPP-12008	NL10-15	TT25X8	ML8-15		TE-1127.3
C4	8	12	①	XPP-12008	NL10-15	TT25X8	ML8-15		TE-1127.3

① Some versions may use 10mfd@ 10 volts, Part No. 581013.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	ROLAND PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	20000			BPD-02	DD-203	BYB6S2		5HK-S2	
C6	20000			BPD-02	DD-203	BYB6S2		5HK-S2	
C7	10000			BPD-01	DD-103	BYA6S1	DC511	TG-S10	①
C8	100000							TG-P10	
C9	100000							TG-P10	
C10	20000			BPD-02	DD-203	BYB6S2		5HK-S2	
C11	4.7			NPO-S14.7	TCZ-4R7	CTA6V47C	ZT-5547	5TCCB-V47	
C12A	10000			BPD-2X01	DD3-103	BYD6DS1	DC511	5HK-2S1	
B	10000						DC511		
C13A	10000			BPD-2X01	DD3-103	BYD6DS1	DC511	5HK-2S1	
B	10000						DC511		
C14	20000			BPD-02	DD-203	BYB6S2		5HK-S2	
C15	2000			BPD-002	DD-202	BYA10D2	DC522	5HK-D2	
C16	.05	200		P288N-05		CUB2S5	GEM-415	2TM-S5	

① Not used in some versions.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	ROLAND PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	5000Ω	½	368023	B-11 † -		Q13-114	U12	Volume
B	Shaft			Not Req.		Not Req.	Not Req	
C	Switch			KB-1orKR-1*		76-1	US-26	Power On-Off

† An extra mounting nut is required back of chassis panel.
* Use KR with CRL "Red Label" controls and KB with "Blue Label controls.

RESISTORS

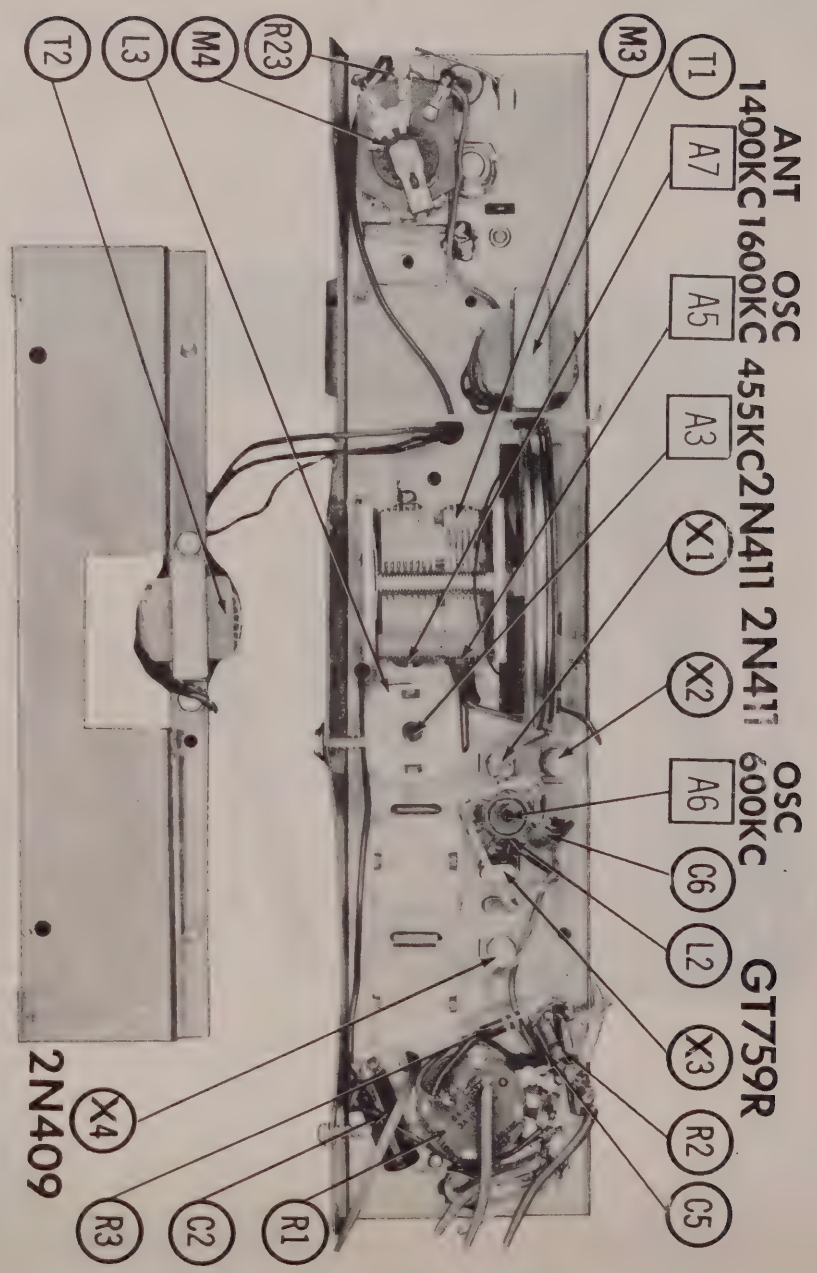
• All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		ROLAND PART No.	NOTES
	OHMS	WATT		
R2	1000Ω			
R3	33K			
R4	470Ω			
R5	1000Ω			
R6	18K			
R7	33K			
R8	1000Ω			
R9	3900Ω			
R10	4700Ω			
R11	330Ω			
R12	22K			
R13	47K			

ITEM No.	RATING		ROLAND PART No.	NOTES
	OHMS	WATT		
R14	2200Ω			
R15	100K			
R16	2000Ω			Note 1
R17	3300Ω			
R18	6800Ω			
R19	33K			
R20	1000Ω			
R21	4700Ω			
R22	100Ω			
R23	33K			
R24	12Ω			

Note 1. Some versions may use 2200Ω in this application.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		ROLAND PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Loopstick	464024					
L2	Osc. Coil	455063					
L3	1st IF	450020					
L4	2nd IF	450022					
L5	3rd IF	450021					

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO		REPLACEMENT DATA						NOTES
	PRI.	SEC.	ROLAND PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	1.5	: 1	430440						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	ROLAND PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	700Ω CT	1-2Ω	430450							

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	ROLAND PART No.	QUAM PART No.	
SP1	5"	PM	3-4Ω	405011	5A1R	Parallel and phase
SP2	5"	PM	3-4Ω	405011	5A1R	

BATTERIES

ITEM No.	VOLTAGE	ROLAND PART No.	REPLACEMENT DATA						NOTES
			BURGESS		EVEREADY		MALLORY		
			"A"	"B"	"A"	"B"	"A"	"B"	
M1	9V			2R①		950 ①		M-13R ①	① 6 Used

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		ROLAND PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N60	359004	1N60	1N295	Detector (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	ROLAND PART No.	NOTES
M3	Tuning Cap.	590045	2 Gang, (Ant. 26-230mmf, Osc. 37-136mmf)
M4	Switch	370037	Local-Distant, Rotary, Wafer Type.

CABINETS & CABINET PARTS

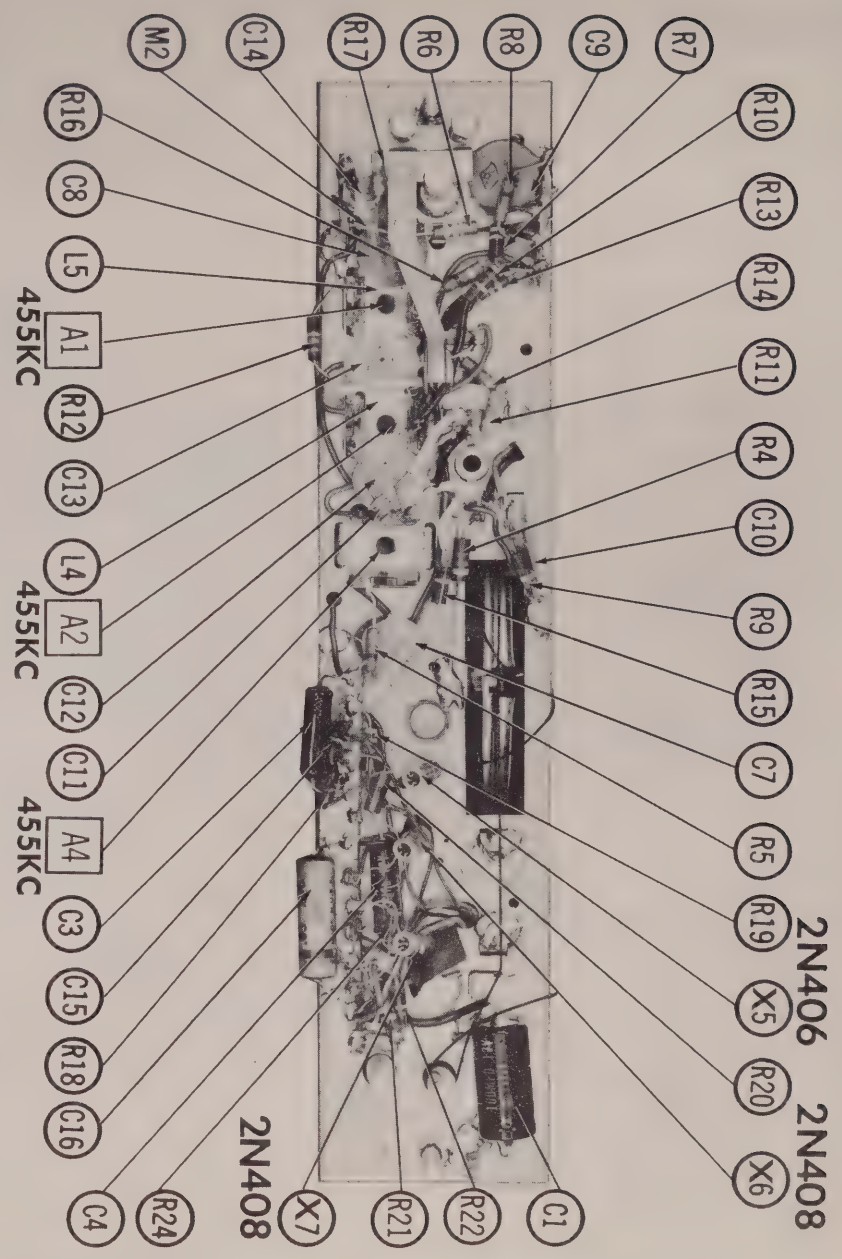
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

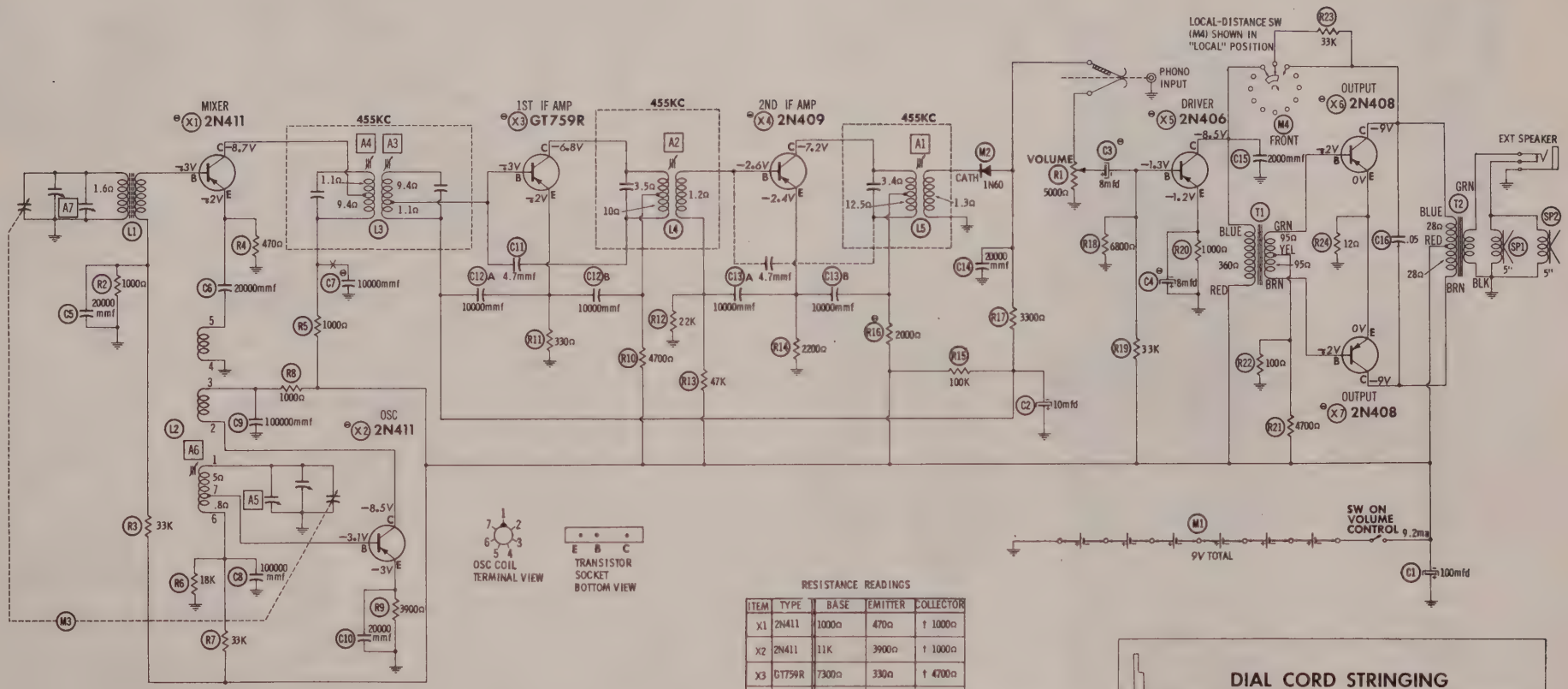
NAME	PART NO.	DESCRIPTION
Knob	272206	On-Off-Volume, Tuning; Mahogany
Knob	272208	Local-Distant Switch; Mahogany
Knob	272205	On-Off-Volume, Tuning; Clear
Knob	272207	Local-Distant Switch; Clear
Handle	790082	
Cabinet	210570	Mahogany Model 71-486
Cabinet	210571	Blond Model 71-486
Cabinet	210572	Ebony Model 71-486

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

CHASSIS—BOTTOM VIEW

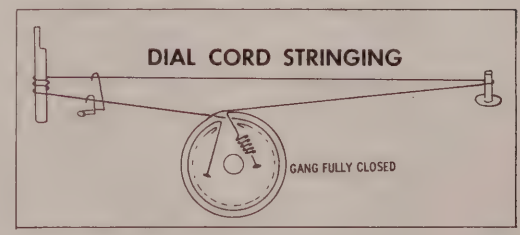




RESISTANCE READINGS

ITEM	TYPE	BASE	EMITTER	COLLECTOR
X1	2N411	1000Ω	470Ω	↑ 1000Ω
X2	2N411	11K	3900Ω	↑ 1000Ω
X3	GT759R	7300Ω	330Ω	↑ 4700Ω
X4	2N409	14K	2200Ω	↑ 2000Ω

RESISTANCE MEASUREMENTS OF X5, X6 & X7 CIRCUITS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.
↑ MEASURED FROM NEGATIVE TERMINAL OF C1.



1. DC voltage measurements taken with vacuum tube voltmeter;
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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ROLAND MODELS
71-485 (7TL), 71-486 (7TW)

PHOTOFACT* Folder

with CIRCUITRACE*

EIA ELECTRONIC INDUSTRIES ASSOCIATION MEMBER

SILVERTONE MODELS 9202, 9203 (Ch. 132.45100)

SILVERTONE MODELS 9202, 9203 (Ch. 132.45100)

MODEL 9202

TRADE NAME	Silvertone Models 9202, 9203 (Ch. 132.45100)
SUPPLIER	Sears, Roebuck & Co., 925 S. Homan Ave., Chicago, Illinois
TYPE SET	Battery Operated Portable Transistorized AM Receiver
POWER SUPPLY	9 Volts DC
RATING	11.3MA @ 9 Volts DC
TUNING RANGE—BROADCAST	540 - 1650KC

SILVERTONE MODELS 9202, 9203 (Ch. 132.45100)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05mfd	High side to antenna stator lug of tuning gang. Low side to B-	455KC (400~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3	Adjust for maximum output.
2.		Loop	1670KC	"	"	A4	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	600KC	600KC	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output while rocking tuning gang. Repeat steps 2 and 3.
4.		"	1400KC	Tune to 1400KC signal	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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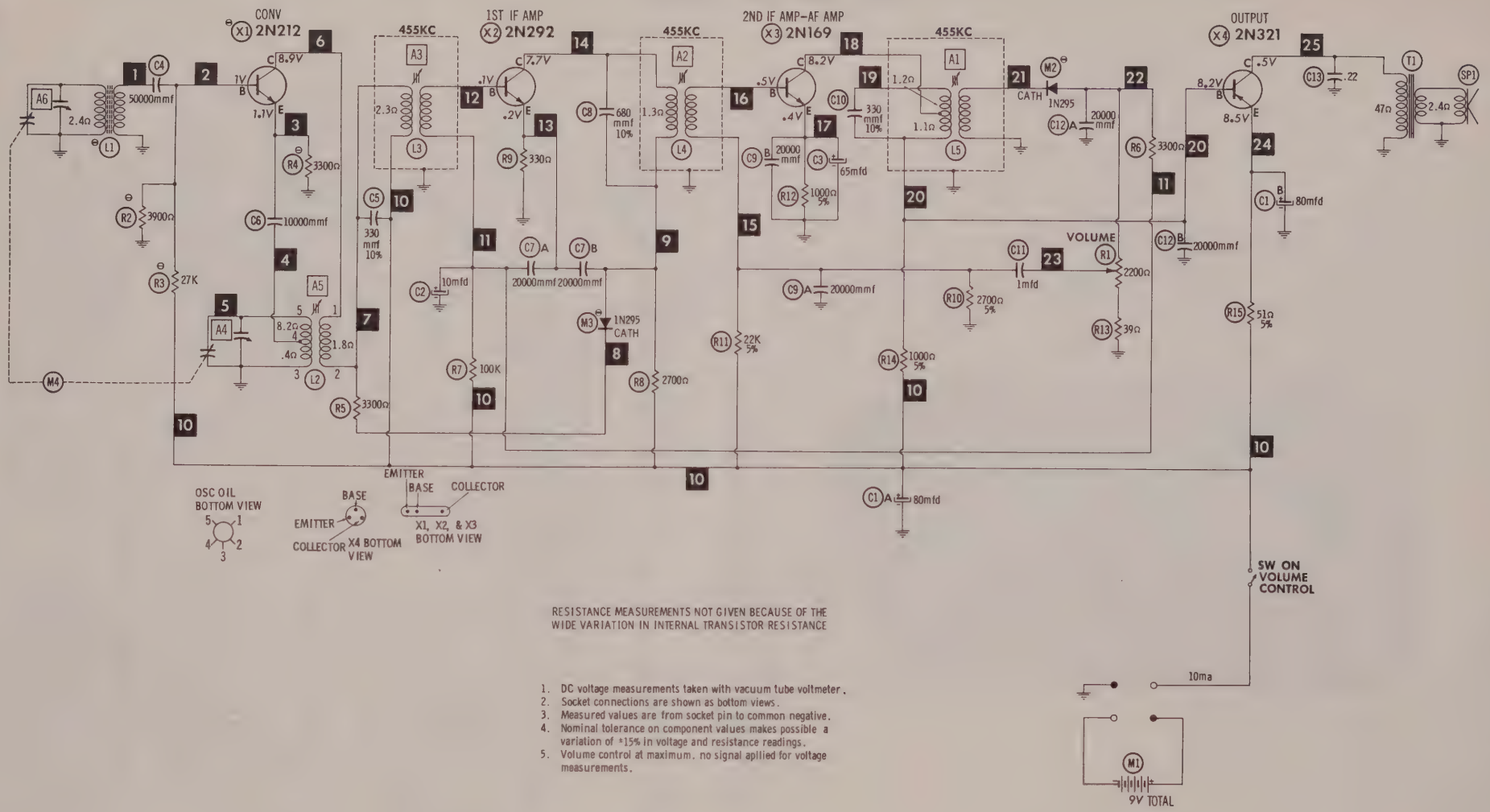
SET 432 FOLDER 11



RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
5. Volume control at maximum, no signal apllied for voltage measurements.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE

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SILVERTONE MODELS 9202, 9203 (Ch. 132.45100)

PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N212	Converter	CBS-2N439			2N212	NPN Note 1
X2	2N292	1st IF Amplifier	CBS-2N439			2N292	NPN
X3	2N169	2nd IF Amp. - AF Amp.	CBS-2N438			2N169A	NPN
X4	2N321	Output		2N270	2N631	2N321	PNP

Note 1. Alternate type 2N168A

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	SILVERTONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	80	10	44397-2						R2514 *
B	80	10							
C2	10	10	44396-4	PWE10010	NL10-10	TT12X10	ML10-15	MQ-0510	TE-1114
C3	65	10	44396-3			TT10X60			TE-1134

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	SILVERTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	50000		43674-9	BPD-05	DA-503		TA-150	5HK-55	
C5	330		44398-331	1469-00033	MD-331	5R5T33		MS-333	10%
C6	10000		43674-11	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C7A	20000	50	44684-4	BPD-2X02	DA-203	BYB6S2	B-120	5HK-2S2	
B	20000	50			DA-203	BYB6S2	B-120		
C8	680		44398-681	1469-00068	MD-681	1R5T68		MS-368	10%
C9A	20000	50	44684-4	BPD-2X02	DA-203	BYB6S2	B-120	5HK-2S2	
B	20000	50			DA-203	BYB6S2	B-120		
C10	330		44398-331	1469-00033	MD-331	5R5T33		MS-333	10%
C11	1.0	3	44684-9						
C12A	20000	50	44684-4	BPD-2X02	DA-203	BYB6S2	B-120	5HK-2S2	
B	20000	50			DA-203	BYB6S2	B-120		
C13	.22	50	45775-1						

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	SILVERTONE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	2200Ω	½	45000-3					Volume and Switch

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		SILVERTONE PART No.	NOTES
	OHMS	WATT		
R2	3900Ω		22381-392	Note 1
R3	27K		22381-273	Note 2
R4	3300Ω		43689-332	Note 3
R5	3300Ω		22381-332	
R6	3300Ω		43689-332	
R7	100K		22381-104	
R8	2700Ω		22381-272	

ITEM No.	RATING		SILVERTONE PART No.	NOTES
	OHMS	WATT		
R9	330Ω		43689-331	
R10	2700Ω 5%		22382-272	
R11	22K 5%		22382-223	
R12	1000Ω 5%		22382-102	
R13	39Ω		22381-390	
R14	1000Ω 5%		22382-102	
R15	51Ω 5%		22382-510	

Note 1. Some versions may use 8200Ω in this application (Part #22381-822).
Note 2. Some versions may use 47K in this application (Part #22381-473).
Note 3. Some versions may use 1500Ω in this application (Part #43689-152)

PRINTED BOARD

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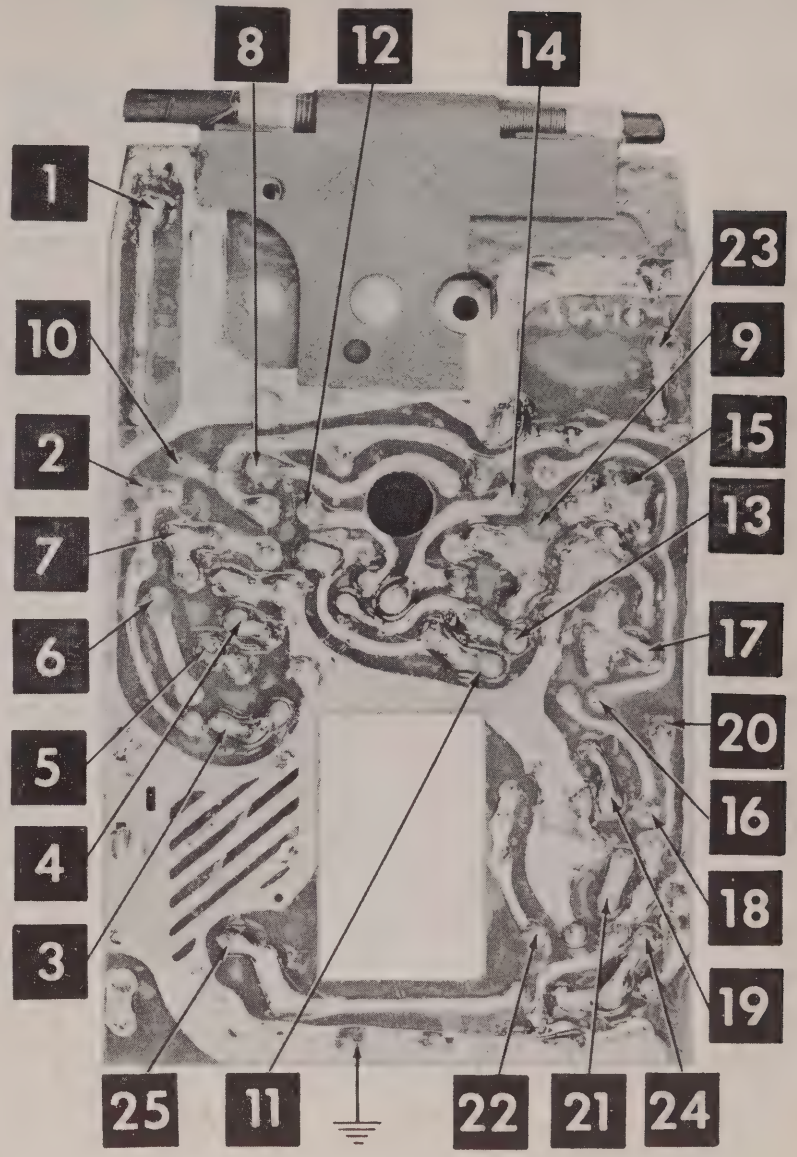


PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		SILVERTONE PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Loopstick	44511-3					Note 1
L2	Osc. Coil	45783-1					
L3	1st IF	44855-5					
L4	2nd IF	44855-6					
L5	3rd IF	44855-7					

Note 1. Some versions may use Part #45511-5.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	SILVERTONE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	612Ω	17Ω	44858-4	GH-105			TA-23	TR-20		

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	SILVERTONE PART No.	QUAM PART No.	
SP1	2 3/4"	PM	16-18Ω	44280-1		

BATTERIES

ITEM No.	VOLTAGE	SILVERTONE PART No.	REPLACEMENT DATA						NOTES
			BURGESS		EVEREADY		MALLORY		
			"A"	"B"	"A"	"B"	"A"	"B"	
M1	9V	6418		P6		226		M1600	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		SILVERTONE PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N295 *		1N60	1N295	Detector (Pigtail)
M3	1N295 *		1N60	1N295	Overload Diode (Pigtail)

* Some versions may use 1N64G in this application (Part #43959).

MISCELLANEOUS

ITEM No.	PART NAME	SILVERTONE PART No.	NOTES
M4	Tuning Cap.	45483	2 Gang (Ant. 14-146mmf, Osc. 10-94mmf)
	Printed Board	45410-1	

CABINETS & CABINET PARTS

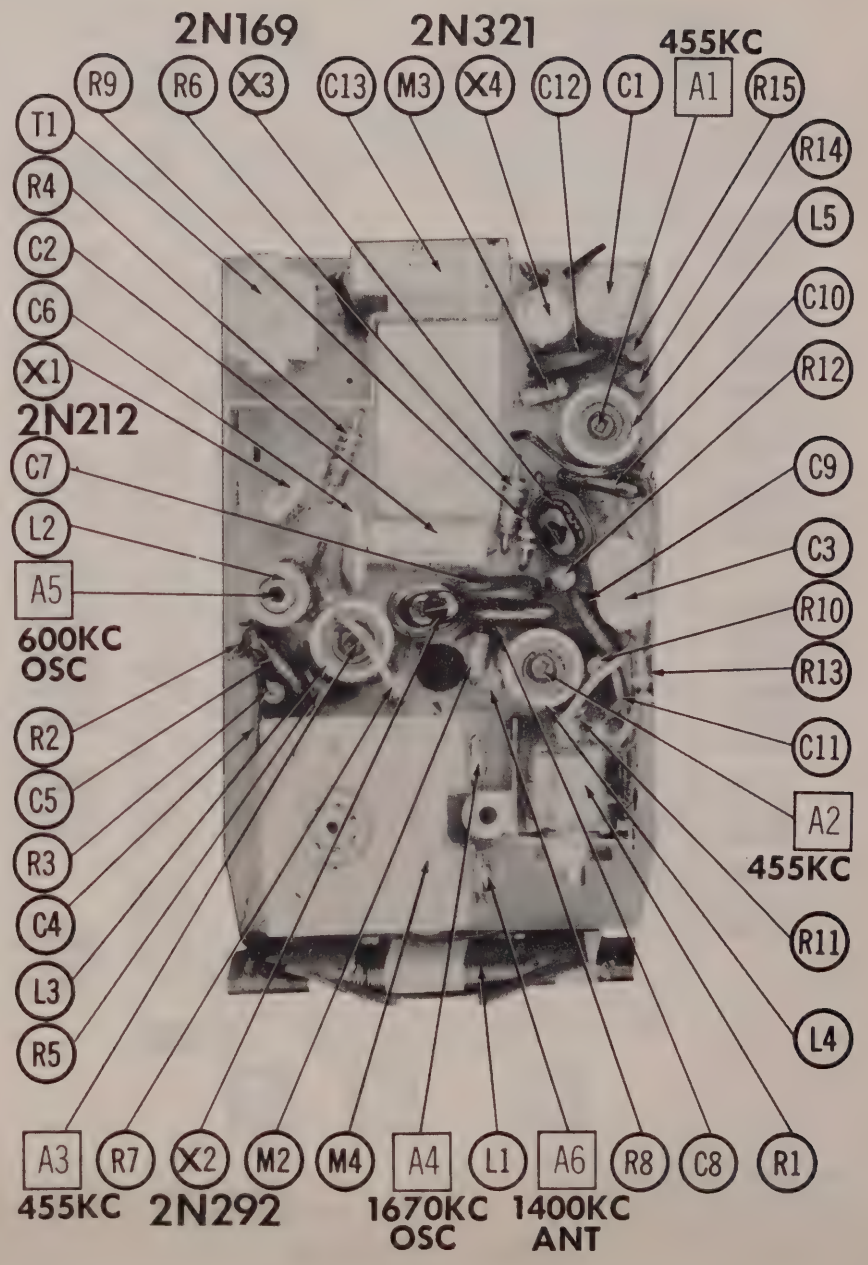
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	45519-59	Tuning, Model 9202
Knob	45519-83	Tuning, Model 9203
Knob	45405-59	On-Off-Volume, Model 9202
Knob	45405-83	On-Off-Volume, Model 9203
Cabinet Ass'y	45404-59	Model 9202
Cabinet Ass'y	45404-83	Model 9203

WIRING DATA

General-use Unshielded Hook-up Wire .....Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

CHASSIS—TOP VIEW



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EIA ELECTRONIC INDUSTRIES ASSOCIATION MEMBER

STEELMAN MODEL 3RP8

STEELMAN MODEL 3RP8

STEELMAN MODEL 3RP8

TRADE NAME	Steelman Model 3RP8
MANUFACTURER	Steelman Phono & Radio Co., Inc., 2-30 Anderson Ave., Mount Vernon, N. Y.
TYPE SET	AC Operated AM Receiver With 4 Speed Manual Record Player
TUBES(Four)	Types 12AU6 Converter, 12AV6 (Or) 12AT6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles
RATING	.275 Amp. @117 Volts AC (26 Watts) Less Motor
TUNING RANGE—BROADCAST	535-1620KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01mfd	Highside to Pin 1 (grid) of 12AU6 (V1). Low side to B-	455KC (400∿ Mod.)	Tuning gang fully open	Across voice coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001mfd to reduce hum modulation
2.	"	"	1600KC	1600KC	"	A3	"
3.		Loop	1400KC	Tune for 1400KC signal	"	A4	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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SET 432 FOLDER 12

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	12AU6	
V2	Det. -AVC-AF Amp.	12AV6	①

① Alternate type 12AT6.

ITEM No.	USE	TYPE	NOTES
V3	Output	50C5	
V4	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	STEELMAN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	150	583020	PRS150V404	BBRT44215	TCT3116	TDLT-4	FMT-312	R1110 *
B	40	150		020					
C	20	150							

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	STEELMAN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	50			SI50	D6-500	LT6Q5	UC-545	5GA-Q5	
C3	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C4	.05	200		P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C5	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	STEELMAN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1meg	½	360081	B-70	A47-1meg-Z	Q13-137	U53	Volume
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	

* Use KR with CRL "Red Label" controls and KB with "Blue Label" controls.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		STEELMAN PART No.	NOTES
	OHMS	WATT		
R2	2.2meg			
R3	1meg			
R4	470K			Note 1
R5	22K			Note 2

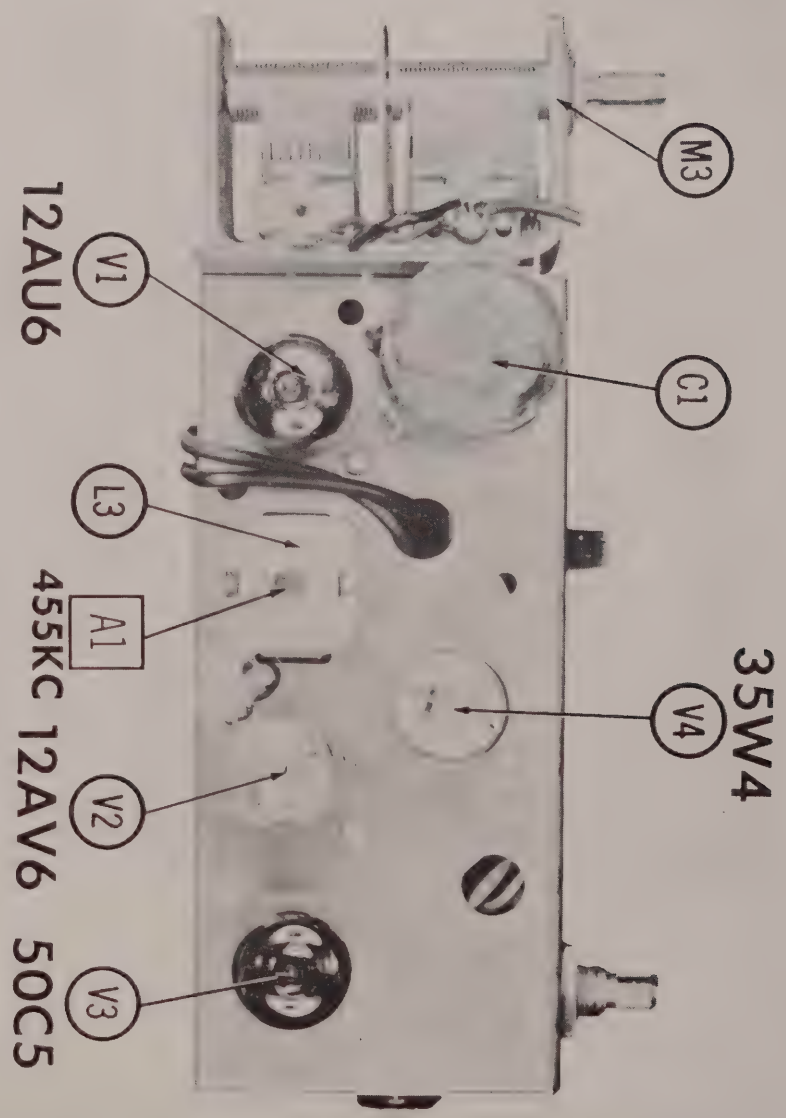
ITEM No.	RATING		STEELMAN PART No.	NOTES
	OHMS	WATT		
R6	100Ω 5%			Note 3
R7	150Ω			
R8	2200Ω			
R9	47Ω	1		

Note 1. Not used in some versions.
Note 2. Some versions may use 47K in this application.
Note 3. Some versions may use 180Ω 1W in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					
		STEELMAN PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loopstick	464018					
L2	Osc. Coil	455055					
L3	IF Trans.	450010					

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2400Ω	3-4Ω	Part of SP1	Z1101 ①	A-3025 ①	AU-605 ①	A-3332 ①	24S53 ①	S-12X ①	① Bend tabs down

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA STEELMAN PART No.	REPLACEMENT DATA QUAM PART No.	NOTES
SP1	4"	PM	3-4Ω	414001	4A07	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	STEELMAN PART No.	REPLACEMENT DATA
K1	Audio Circuit	220mmf, 250mmf, 250mmf, 5000mmf, 5000mmf 470K, 470K, 6.8meg	420006	Aerovox PA-113-2 Centralab PC-151 Cornell-Dubilier 116TM2 Sprague DT-2

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA STEELMAN PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	JENSEN PART No. CARTRIDGE	JENSEN PART No. NEEDLE	REMARKS
M1	321510	16 * PR-16	N4-2J			* Tone arm complete with cartridge

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA STEELMAN PART No.	JENSEN PART No.	WALCO PART No.	REMARKS
M2	329201	* J-152 or † J-252 or ♦ J-252D	* WA-100-2 or * WA-200-2 or † WS-400-2	* Metal † Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	STEELMAN PART No.	NOTES
M3	Tuning Cap	590020	2 Section, Ant. 36-485mmf, Osc. -29-228mmf
M4	Switch	370024	Radio-Phono, DPDT, Slide Type
M5	Phono Motor	310121	3 Speed, Alliance

CABINETS & CABINET PARTS

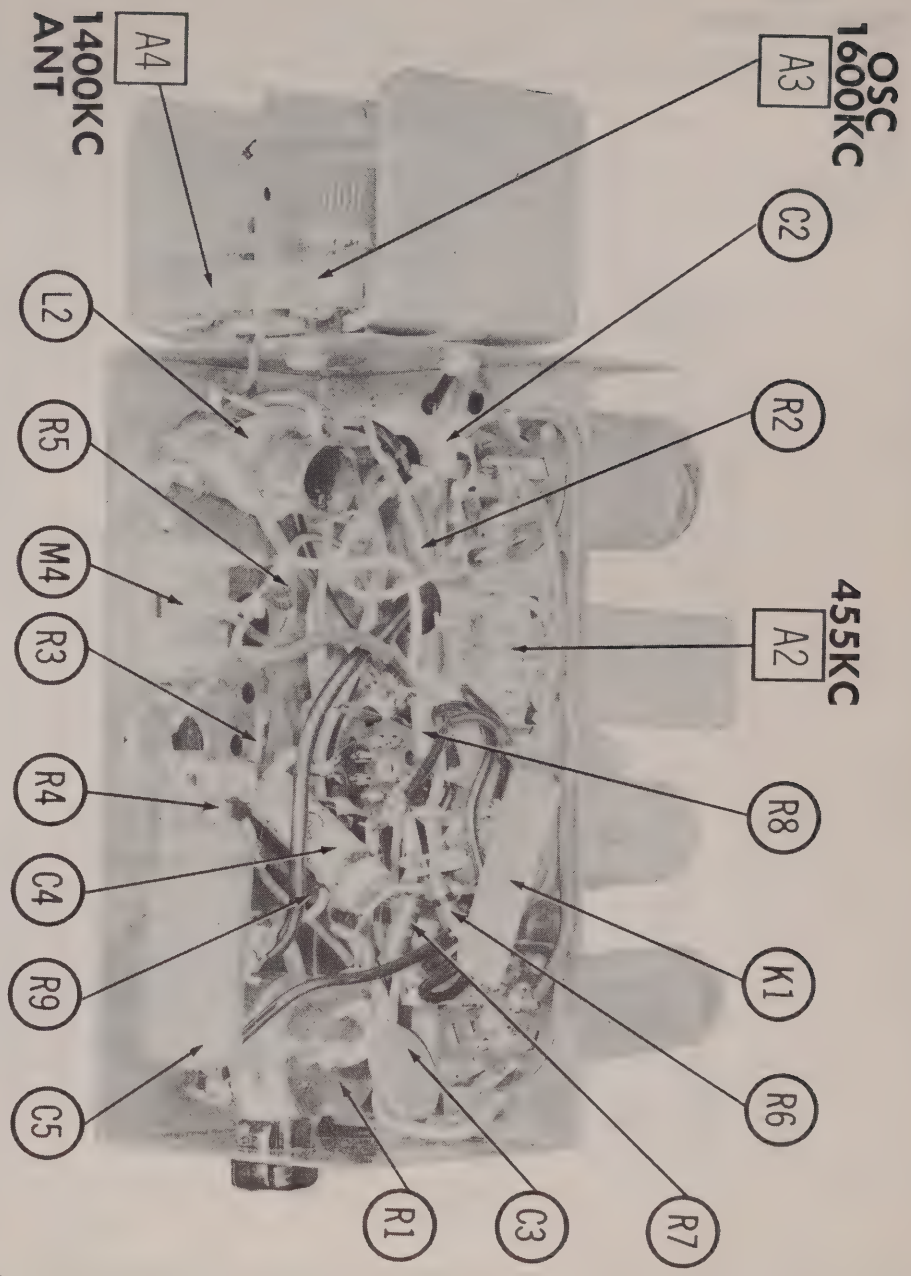
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

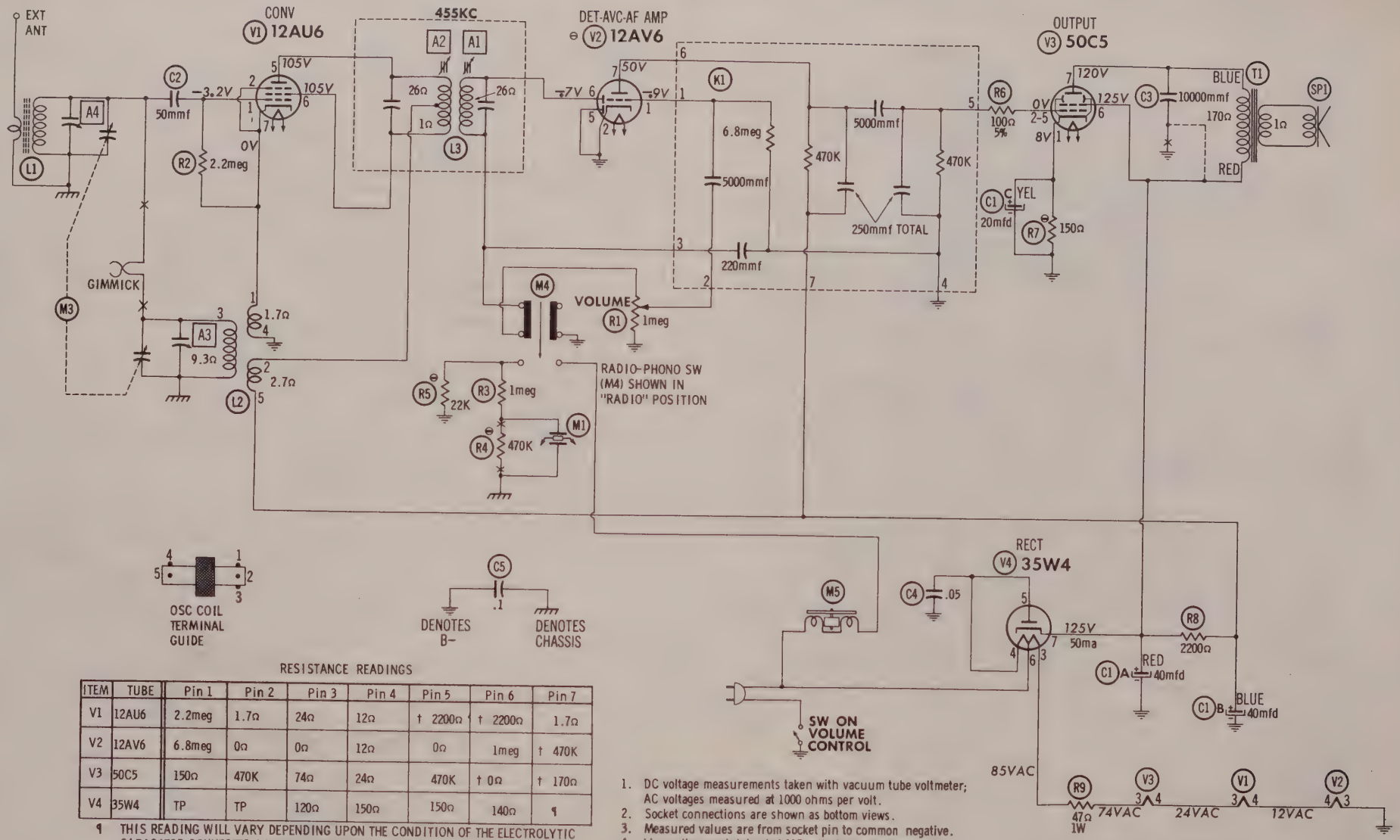
NAME	PART NO.	DESCRIPTION
Knob	270138	Tuning
Knob	270112	On-Off Volume
Cabinet	230880	

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

CHASSIS—BOTTOM VIEW





RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AU6	2.2meg	1.7Ω	24Ω	12Ω	† 2200Ω	† 2200Ω	1.7Ω
V2	12AV6	6.8meg	0Ω	0Ω	12Ω	0Ω	1meg	† 470K
V3	50C5	150Ω	470K	74Ω	24Ω	470K	† 0Ω	† 170Ω
V4	35W4	TP	TP	120Ω	150Ω	150Ω	140Ω	¶

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.

† MEASURED FROM PIN 7 OF V4.

TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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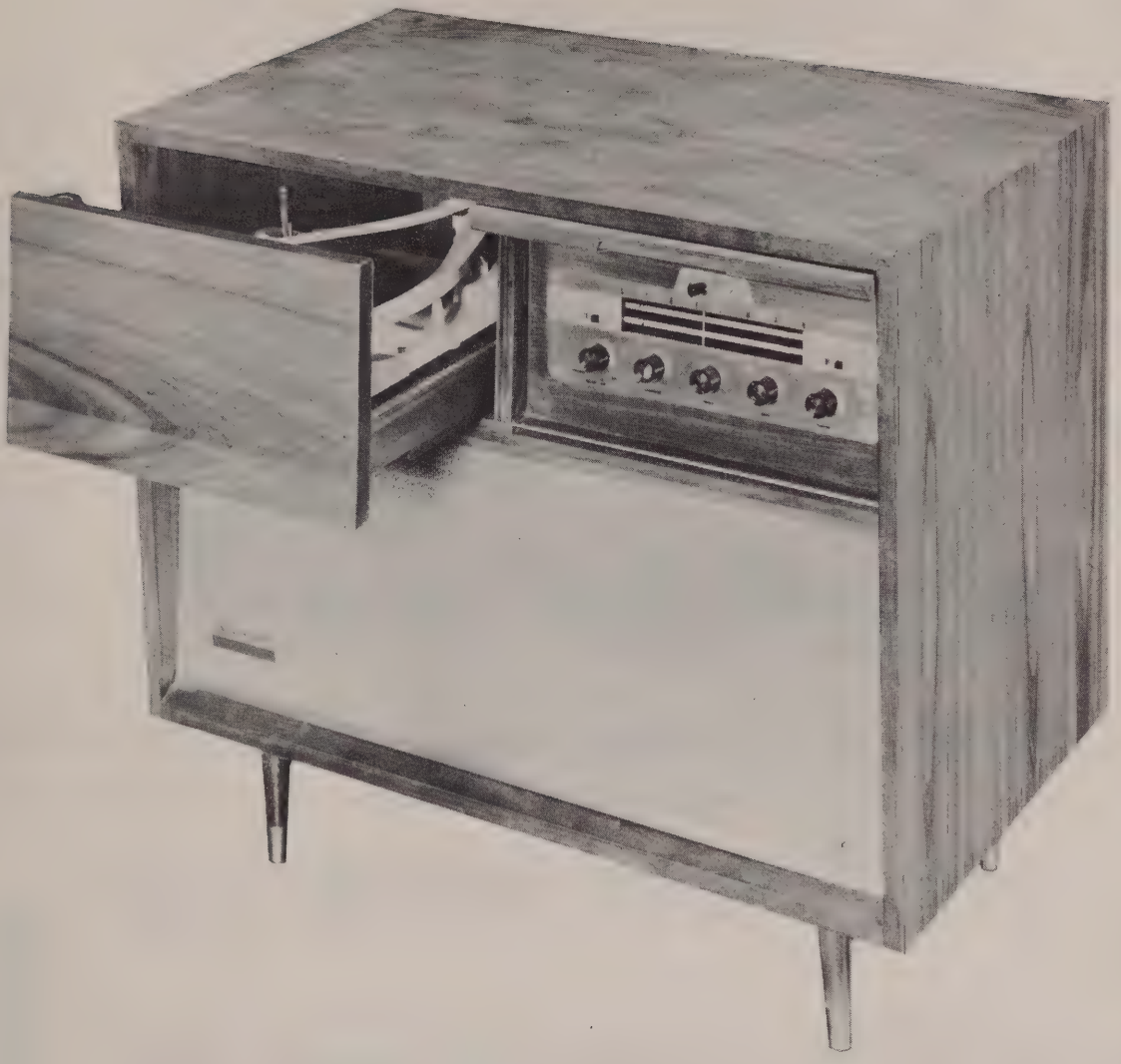
STEELMAN MODEL 3RP8

PHOTOFACT* Folder
with CIRCUITRACE*
EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

STEELMAN MODELS 4AR8, 4AR11

STEELMAN MODELS
4AR8, 4AR11



STEELMAN MODELS
4AR8, 4AR11

TRADE NAME	Steelman Models 4AR8, 4AR11		
MANUFACTURER	Steelman Phono & Radio Co., Inc., 2-30 Anderson Ave., Mount Vernon, N. Y.		
TYPE SET	AC Operated FM-AM Receiver With 4 Speed Automatic Record Changer		
TUBES	Eleven		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	.73 Amp. @ 117 Volts AC (74 Watts) FM
TUNING RANGE - BROADCAST	535 - 1650KC	FREQ. MOD.	88 - 108MC

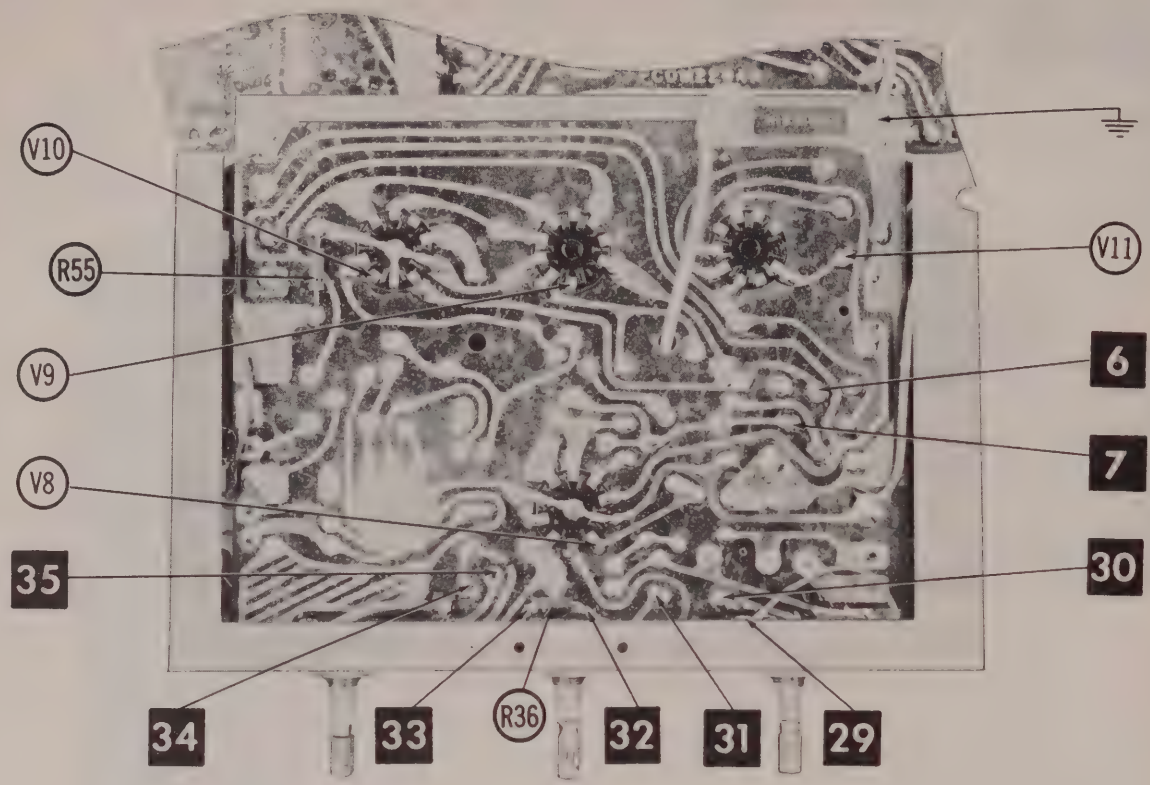
FOR SERVICE INFORMATION ON RECORD CHANGER PART #300032 - SEE V-M 1200A - PHOTOFACT SET 353 FOLDER 16 OR RECORD CHANGER MANUAL RC-10

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

H785

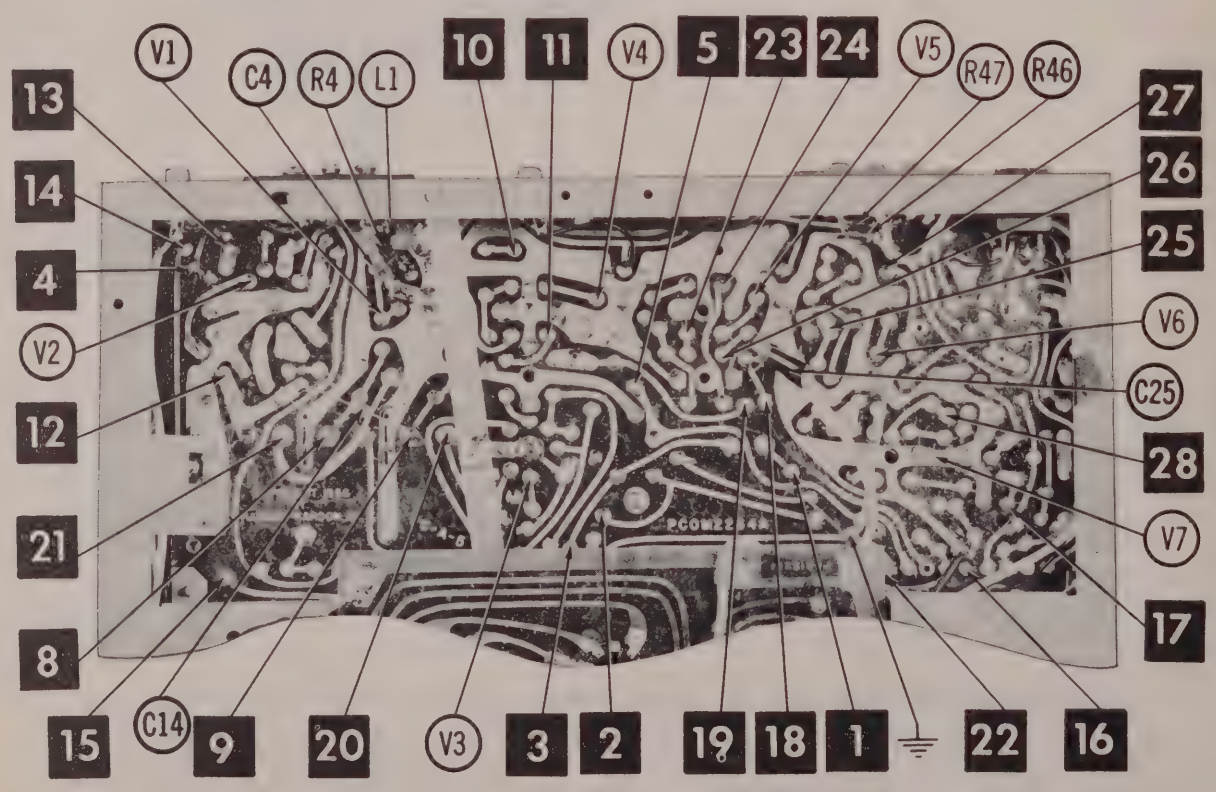
SET 432 FOLDER 13



A Howard W. Sams CIRCUITRACE® Photo

AUDIO
PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



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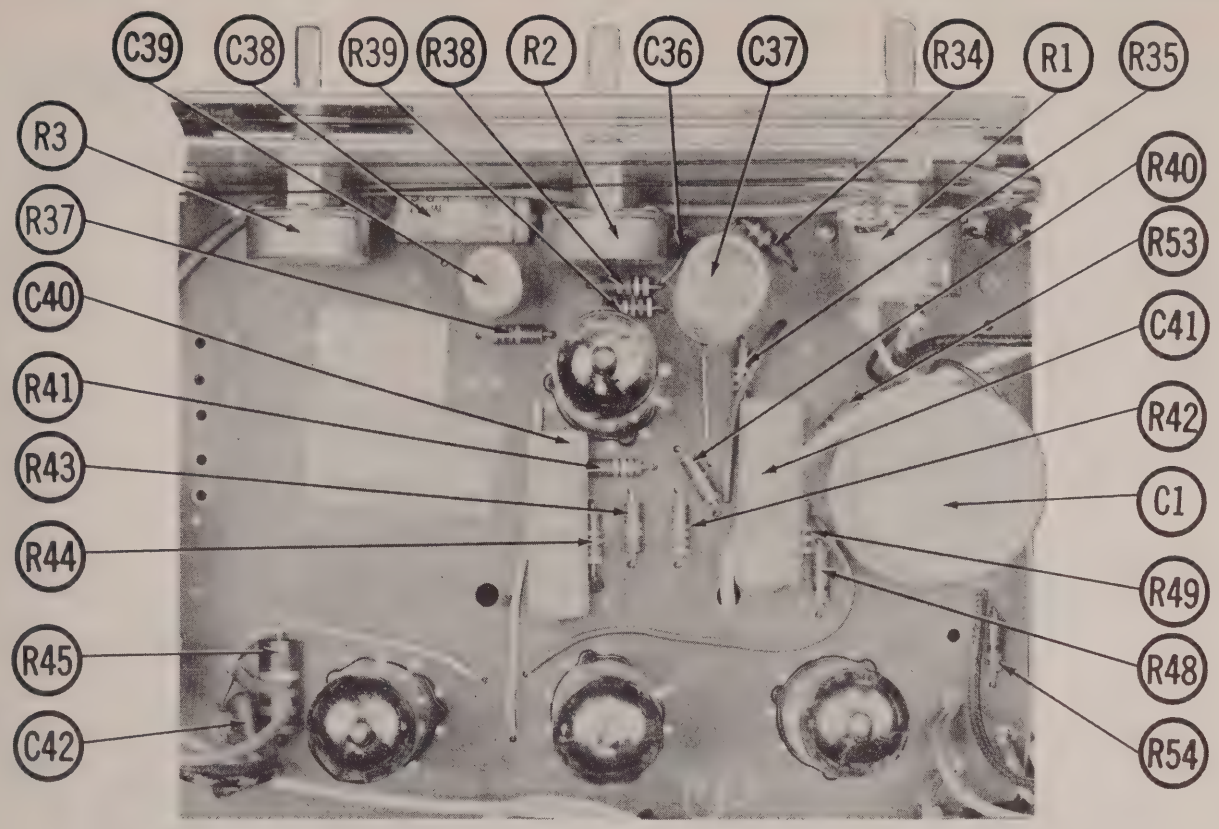
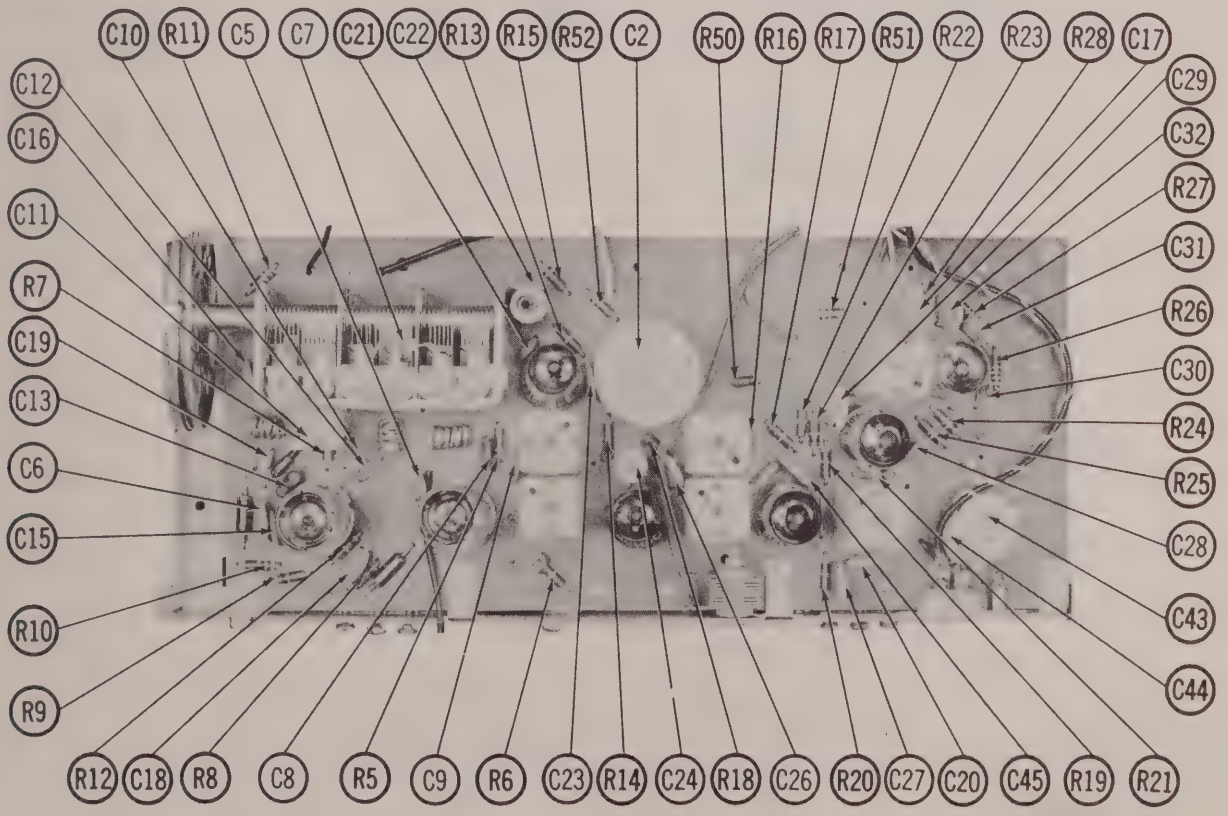
RF-IF
PRINTED BOARD

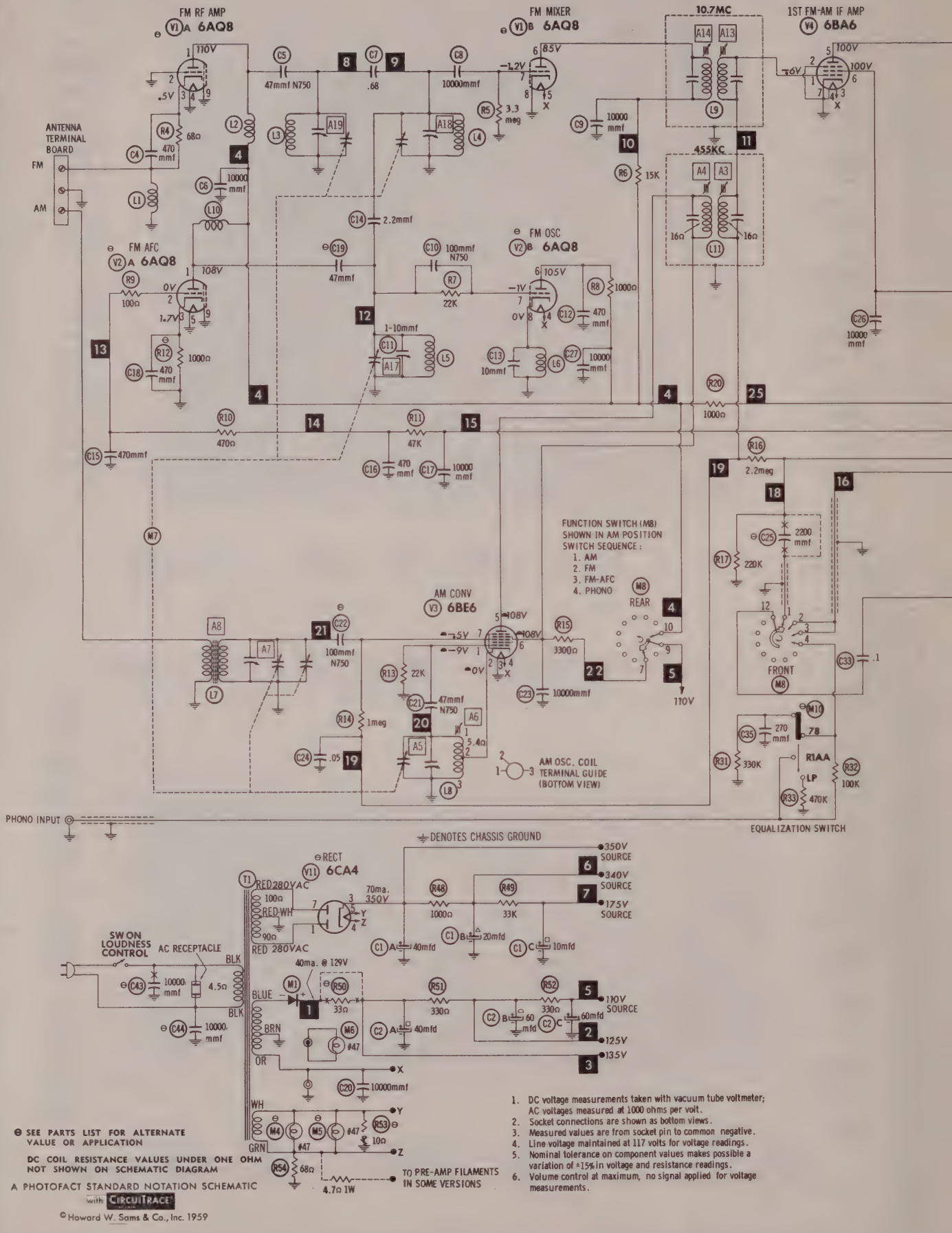
ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



AUDIO CHASSIS - TOP VIEW



RF-IF CHASSIS - CAPACITOR & RESISTOR IDENT



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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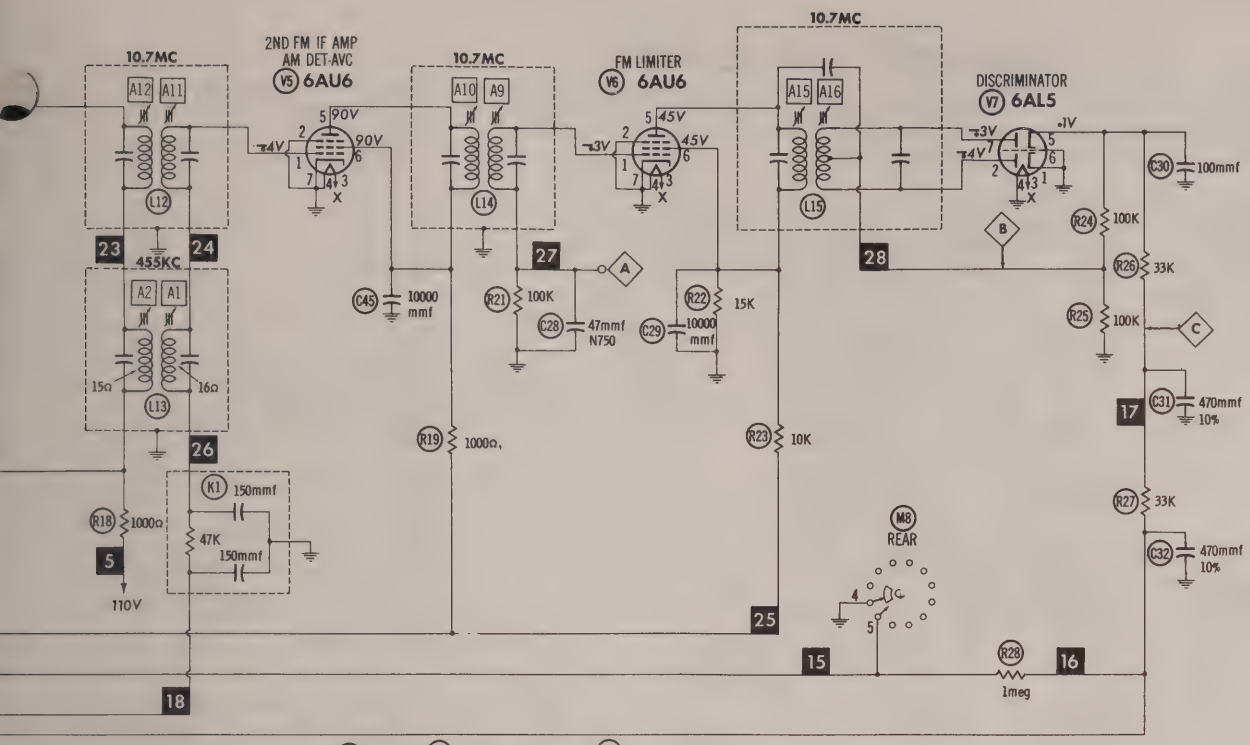
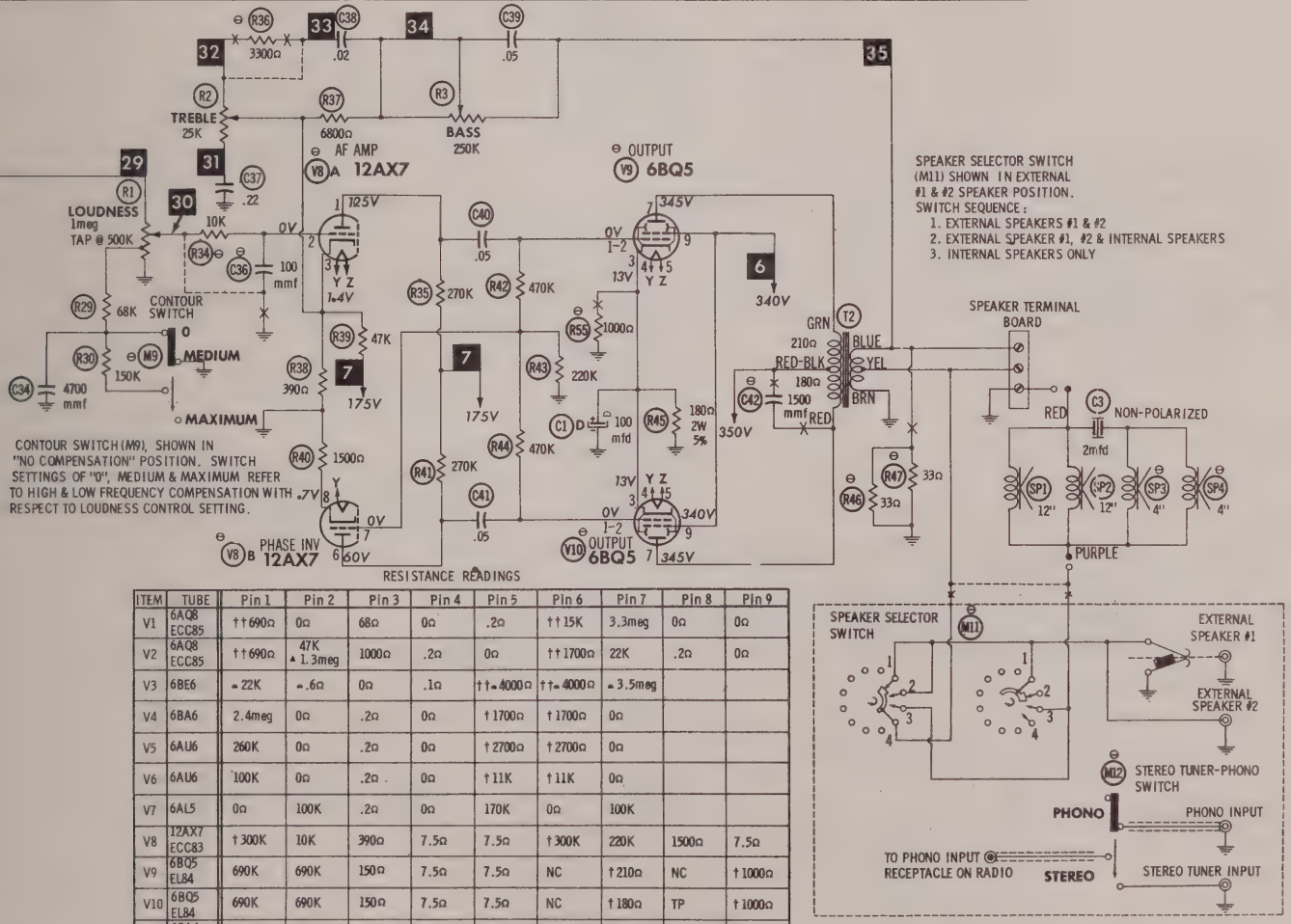




RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AQ8 ECC85	††690Ω	0Ω	68Ω	0Ω	.2Ω	††15K	3.3meg	0Ω	0Ω
V2	6AQ8 ECC85	††690Ω	47K ▲1.3meg	1000Ω	.2Ω	0Ω	††1700Ω	22K	.2Ω	0Ω
V3	6BE6	-22K	-.6Ω	0Ω	.1Ω	††-4000Ω	††-4000Ω	-3.5meg		
V4	6BA6	2.4meg	0Ω	.2Ω	0Ω	†1700Ω	†1700Ω	0Ω		
V5	6AU6	260K	0Ω	.2Ω	0Ω	†2700Ω	†2700Ω	0Ω		
V6	6AU6	100K	0Ω	.2Ω	0Ω	†11K	†11K	0Ω		
V7	6AL5	0Ω	100K	.2Ω	0Ω	170K	0Ω	100K		
V8	12AX7 ECC83	†300K	10K	390Ω	7.5Ω	7.5Ω	†300K	220K	1500Ω	7.5Ω
V9	6BQ5 EL84	690K	690K	150Ω	7.5Ω	7.5Ω	NC	†210Ω	NC	†1000Ω
V10	6BQ5 EL84	690K	690K	150Ω	7.5Ω	7.5Ω	NC	†180Ω	TP	†1000Ω
V11	6CA4 EZ81	90Ω	NC	¶	7.5Ω	7.5Ω	NC	100Ω	NC	NC

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
- MEASURED IN "AM" POSITION. ▲ MEASURED IN "FM-AFC" POSITION.
† MEASURED FROM PIN 3 OF V11. NC NO CONNECTION
†† MEASURED FROM OUTPUT OF M1. TP TIE POINT

STEELMAN MODELS 4AR8, 4AR11

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01mfd	High side to AM antenna stator lug of tuning gang. Low side to chassis.	455KC (400~ Mod.)	AM	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	"	"	1600KC	"	1600KC	"	A5	"
3.	"	"	600KC	"	600KC	"	A6	Adjust for maximum output while rocking tuning gang. Repeat steps 2 and 3.
4.	"	High side to AM antenna terminal. Low side to chassis.	1400KC	"	Tune to 1400KC signal	"	A7	Adjust for maximum output.
5.	"	"	600KC	"	Tune to 600KC signal	"	A8	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6.	200mmf	High side to FM RF stator lug of tuning gang. Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe thru 1meg resistor to point Ⓐ. Common to chassis.	A9, A10, A11, A12, A13, A14	Adjust for maximum deflection.
7.	"	"	"	"	"	DC probe thru 1meg resistor to point Ⓑ. Common to chassis.	A15	"
8.	"	"	"	"	"	DC probe thru 1meg resistor to point Ⓒ. Common to chassis.	A16	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
6.	200mmf	High side to FM RF stator lug of tuning gang. Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. thru 27K resistor to point Ⓐ. Low side to chassis.	A9, A10, A11, A12, A13, A14	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7.	"	"	"	"	"	Vert. Amp. thru 27K resistor to point Ⓑ. Low side to chassis.	A15	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
8.	"	"	"	"	"	Vert. Amp. thru 27K resistor to point Ⓒ. Low side to chassis.	A16	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A15 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	270Ω Carbon Resistor	High side to FM antenna terminal. Low side to chassis.	108MC (Unmod.)	FM	108MC	DC probe thru 100K resistor to point Ⓐ. Common to chassis.	A17, A18, A19	Adjust for maximum deflection.
	If receiver fails to track properly, step 10 should be followed.							
10.	270Ω Carbon Resistor	High side to FM antenna terminal. Low side to chassis	90MC	FM	90MC	DC probe thru 100K resistor to point Ⓐ. Common to chassis.	L5, L4, L3	Adjust for maximum deflection by compressing or expanding coil turns. Repeat step 9.

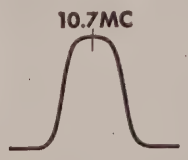


FIG. 1

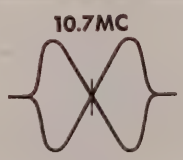
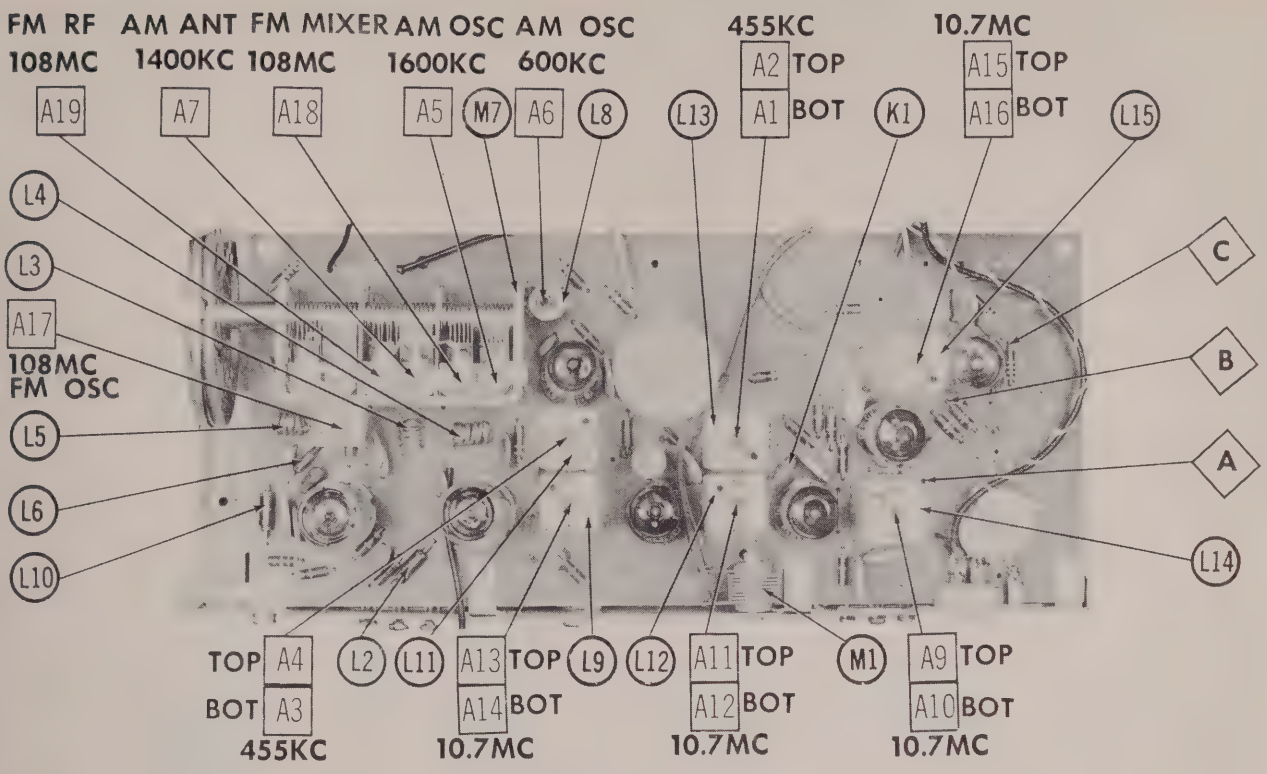
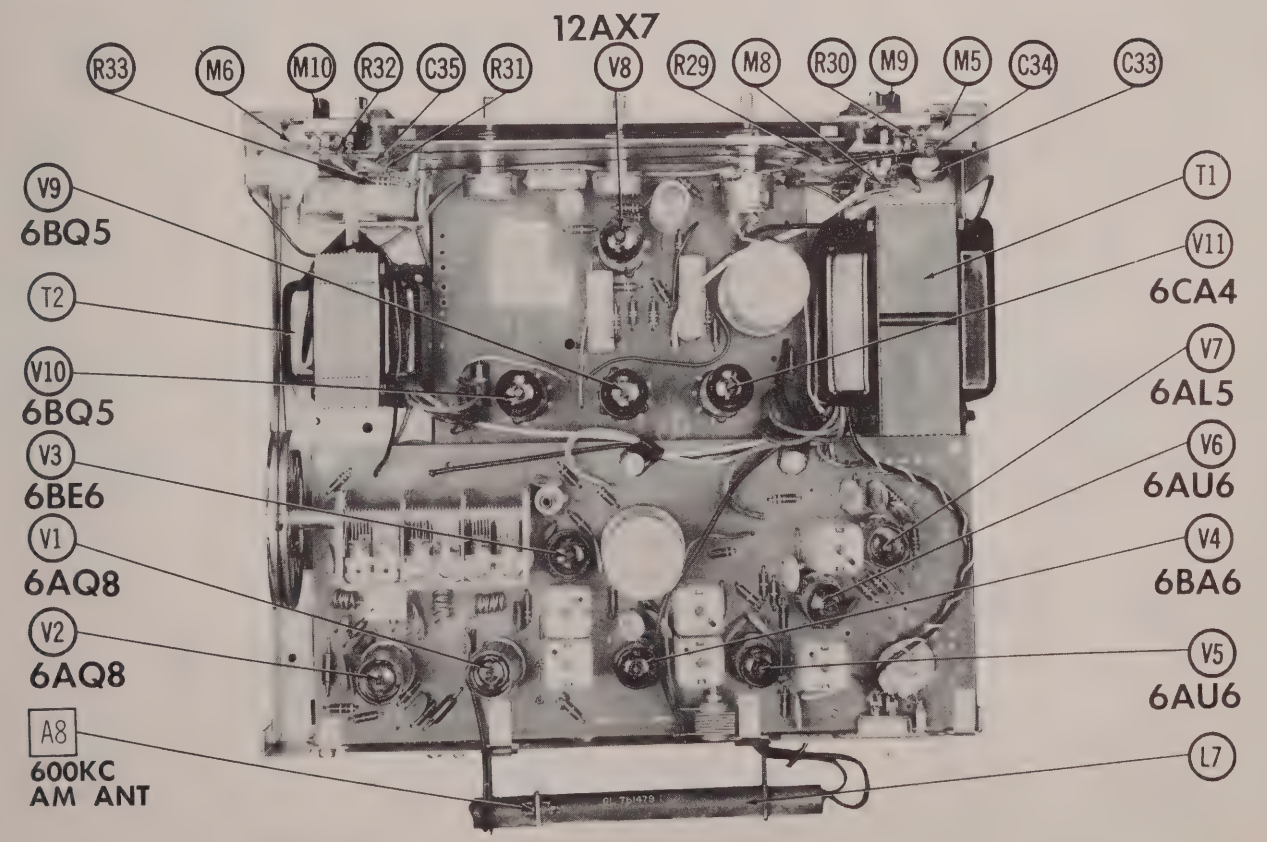


FIG. 2



RF - IF CHASSIS - ALIGN, INDUCTOR & MISC IDENT



CHASSIS - TOP VIEW

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	STEELMAN PART No.	NOTES
R4	68Ω			
R5	3.3meg			
R6	15K			
R7	22K			
R8	1000Ω			
R9	100Ω			
R10	470K			
R11	47K			
R12	1000Ω			①
R13	22K			
R14	1meg			
R15	3300Ω			
R16	2.2meg			
R17	220K			
R18	1000Ω			
R19	1000Ω			
R20	1000Ω			
R21	100K			
R22	15K			
R23	10K			
R24	100K			
R25	100K			
R26	33K			
R27	33K			
R28	1meg			
R29	68K			
R30	150K			
R31	330K			
R32	100K			
R33	470K			
R34	10K			②
R35	270K			
R36	3300Ω			③
R37	6800Ω			
R38	390Ω			
R39	47K			
R40	1500Ω			
R41	270K			
R42	470K			
R43	220K			
R44	470K			
R45	180Ω 5%	2		
R46	33Ω			③
R47	33Ω			③
R48	1000Ω			
R49	33K			
R50	33Ω			③
R51	330Ω			
R52	330Ω			
R53	10Ω			④
R54	68Ω			
R55	1000Ω			③

① Some versions may use 560Ω in this application.
② Some versions may use 100K in this application.
③ Not used in some versions.
④ Some versions may use 68Ω in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA STEELMAN PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Cathode Choke				4584		.24 Microhenry
L2	RF Choke	455057	19-1003	BC-564	4608		3.3 Microhenries
L3	FM Ant. Coil						
L4	FM RF Coil						
L5	FM Osc. Coil						
L6	Cathode Choke	455059	19-1000	BC-561	4602	VP-9	1 Microhenry
L7	Loopstick						
L8	AM Osc. Coil	455060					
L9	1st FM IF	450024	16-3490		1463-PC		
L10	RF Choke	455057	19-1003	BC-564	4608		3.3 Microhenries
L11	1st AM IF	450026	16-6780	BC-356	13-PC1	RF-4	
L12	2nd FM IF	450025	16-3490		1463-PC		
L13	2nd AM IF	450028	16-6780	BC-357	13-PC2	RF-4	
L14	3rd FM IF	450025	16-3490		1463-PC		
L15	Discriminator	450027	17-3490		1464-PC		

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .77A SEC. 3 6.3V @ 2.9A	500VCT @ .070A	130V @ .040A Tap @ 6.3V @ 2A	440017						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	8000Ω CT	3-4Ω Tap @ 1-2Ω	430360	Z1009 ①	A-2904①	AU-600①	A-3852 ①	24S61 ①	S-55Z ①	① Drill new mounting holes

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA STEELMAN PART No.	REPLACEMENT DATA QUAM PART No.	NOTES
SP1	12"	PM	3-4Ω	409005 ①	12A6A ①	① Parallel and phase
SP2	12"	PM	3-4Ω	409006 ①	12A6A ①	② Alternate part #409009
SP3	4"	PM	3-4Ω	404009 ①②	4A1TZ4.7 ①	
SP4	4"	PM	3-4Ω	404009 ①②	4A1TZ4.7 ①	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	STEELMAN PART No.	REPLACEMENT DATA
K1	Detector RF Filter	150mmf, 150mmf, 47K	420010	Aerovox PA-98 Centralab PC-51 Cornell-Dubilier 11TM2 Sprague D-2

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA STEELMAN PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M1	.040A	380014		T065 SD-94 ①	65A K200 ①	① Silicon Type

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	FM RF Amp. - FM Mixer	6AQ8/ECC85
V2	FM Osc. - AFC	6AQ8/ECC85
V3	AM Converter	6BE6
V4	1st FM-AM IF Amp.	6BA6
V5	2nd FM IF Amp. - AM Det. - AVC	6AU6

ITEM No.	USE	TYPE
V6	FM Limiter	6AU6
V7	Discriminator	6AL5
V8	AF Amp. - Phase Inv.	12AX7/ECC83
V9	Output	6BQ5/EL84
V10	Output	6BQ5/EL84
V11	Rectifier	6CA4/EZ81

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA STEELMAN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	350	584003						PCL-4627
B	▲20	350							
C	■10	350							
D	▲100	50							
C2A	■40	150	584004						PCL-3443.5
B	60	150							
C	60	150							
C3	2	50NP	581018	NP-PRS50V2	BBR4-50 BBR4-50 †	TT50X5 TT50X5 †	TD-4-50 TD-4-50 †	MT-0504 MT-0504 †	R2233 *

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA STEELMAN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	470			SI 470	D6-471	LT6T47	UC-5347	5GA-T47	
C5	47			N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750
C6	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C7	. 68				TCZ-R68				
C8	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C9	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C10	100			N750-DI 100	DTN-100	C10T1U	NT-531	5TCU-T1	N750
C11	1-10		590041						
C12	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C13	10			SI 10	D6-100	LT6Q1	UC-541	5GA-Q1	
C14	2. 2			NPO-SI 2. 2	TCZ-2R2	CTA6V22C		5TCCB-V22	

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C15	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C16	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C17	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C18	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C19	47			BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47	①
C20	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C21	47			N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750
C22	100			N750-DI 100	DTN-100	C10T1U	NT-531	5TCU-T1	② N750
C23	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C24	. 05	200	420011	P288N-05	DF-503	BC2S47J	ACE615	2SE-S47	
C25	2200			SI 2200	D6-222	LT6D22	UC-5222	5GA-D22	③
C26	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C27	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C28	47			N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750
C29	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C30	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C31	470				D6-471	5R5T47		MS-347	10%
C32	470				D6-471	5R5T47		MS-347	10%
C33	. 1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C34	4700			SI 4700	D6-472	LT6D47	UC-5247	5GA-D47	
C35	270			SI 270	D6-271	LT6T27	UC-5327	5GA-T27	
C36	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	①
C37	. 22	200		P288N-22		BC2P22J	ACE6022	2SE-P22	
C38	. 02	200		P288N-02	D6-203	CUB4S2	GEM-412	2TM-S2	
C39	. 05	200	420011	P288N-05		BC2S47J	ACE615	2SE-S47	
C40	. 05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C41	. 05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C42	1500			SI 1500	D6-152	LT6D15	UC-5215	5GA-D15	③
C43	10000	1400		DAC-27	DD16-103	HVE16S1		BL-S10	③
C44	10000	1400		DAC-27	DD16-103	HVE16S1		BL-S10	④
C45	10000			BPD-01	DD-103	BYA6S1	DC511	5HK-S1	

① Some versions may use 10mmf in this application.
② Some versions may use 10000mmf in this application.
③ Not used in some versions.
④ Some versions may use . 047mfd in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA STEELMAN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1meg	½	368017					Loudness, Tap ② 500K
B	Switch							
R2	25K	½	368014					Treble
R3	250K	½	368015					Bass

PARTS LIST AND DESCRIPTIONS (Continued)

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	STEELMAN PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M2	322517	118-TS	N8-1 & N8-3			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	STEELMAN PART No.	JENSEN PART No.	WALCO PART No.	
M3	329307 (78)	† CRA-55 or ♦ CRA-55D	† W-64S or ♦ W-64D	† Jewel ♦ Diamond
	329107 (LP)	† CRA-55LP or ♦ CRA-55LPD	† W-64MGS or ♦ W-64MGD	

MISCELLANEOUS

ITEM No.	PART NAME	STEELMAN PART No.	NOTES
M4	Lamp	355001	#47 Some versions may use type #51
M5	Lamp	355001	#47 Some versions may use type #51
M6	Lamp	355001	#47
M7	Tuning Cap.	590042	6 Section, AM-FM
M8	Switch	370033	Function, Rotary, Wafer Type
M9	Switch	370046	Contour, 3 Position, Slide Type, Model 4AR11
		370035	Contour, 3 Position, Slide Type, Model 4AR8
M10	Switch	370046	Equalization, 3 Position, Slide Type, Model 4AR11
		370035	Equalization, 3 Position, Slide Type, Model 4AR8
M11	Switch		Speaker Selector, 3 Position, Rotary, Wafer Type, Model 4AR11
M12	Switch		Stereo Tuner-Phono, DPST, Slide Type
			Not used in some versions
	Printed Board	PCOM2264A	Tuner
	Printed Board	P621221H	Amp.

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	272201	Unmarked
Knob	272202	Marked
Cabinet	210740	Mahogany, Model 4AR11
Cabinet	210741	Limed Oak, Model 4AR11
Cabinet	210742	Fruitwood, Model 4AR11
Cabinet	210743	Walnut, Model 4AR11
Cabinet	210744	Ebony, Model 4AR11
Cabinet	210313	Limed Oak, Model 4AR8
Cabinet	210314	Mahogany, Model 4AR8
Leg	210317	Limed Oak, Model 4AR8
Leg	210318	Mahogany, Model 4AR8
Dial Pointer	674030	
Dial Glass	800112	

WIRING DATA

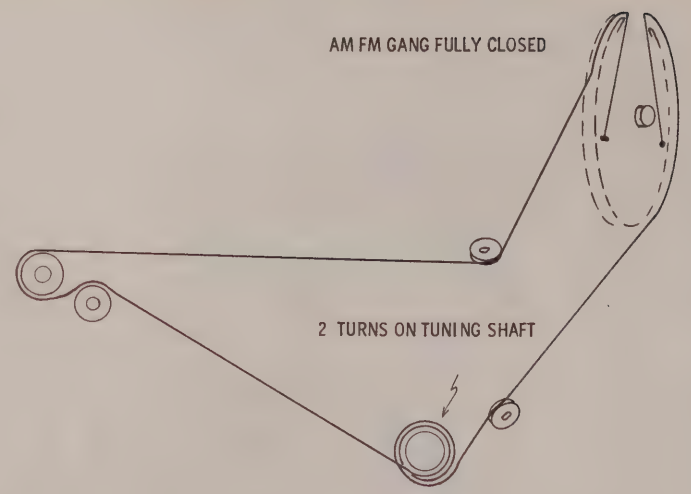
General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

Low-Loss Shielded Lead (Interconnecting) .....Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)

DIAL CORD STRINGING

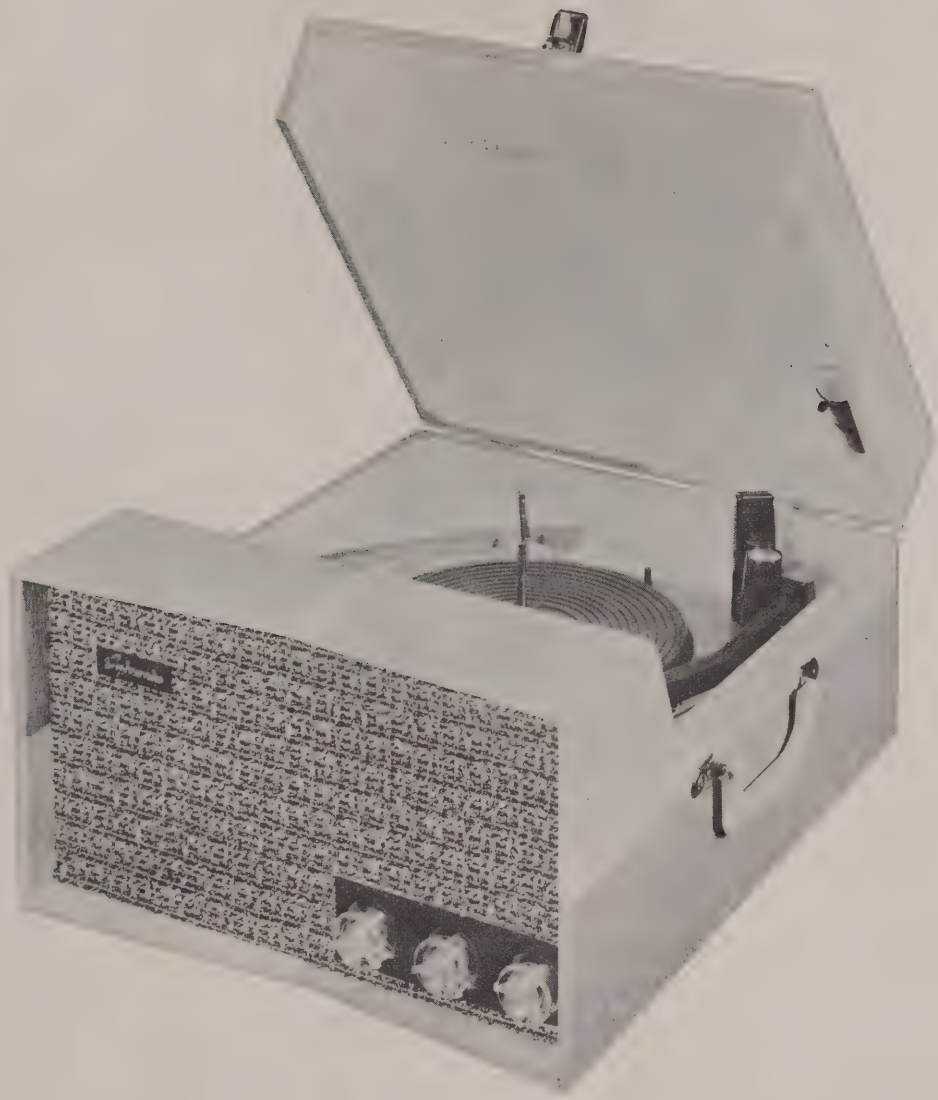


PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

SYLVANIA MODEL 4406 (Ch. 1-623-1)

SYLVANIA MODEL
4406 (Ch. 1-623-1)



SYLVANIA MODEL
4406 (Ch. 1-623-1)

TRADE NAME	Sylvania Model 4406 (Ch. 1-623-1)
MANUFACTURER	Sylvania Home Electronics, Div. of Sylvania Electric Products Inc., 700 Ellicott St., Batavia, N.Y.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES (Three)	Types 12AX7 AF Amp.-Phase Inv., (2) 50C5 Output
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING .37 Amp. @117 Volts AC (32 Watts) Less Motor

FOR SERVICE INFORMATION ON RECORD CHANGER--SEE SYLVANIA 1-318-2-- PHOTOFACT SET 401 FOLDER 13.

SET 432 FOLDER 14

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

H788

DATE 2-59 SET 432 FOLDER 14

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. -Phase Inv.	12AX7	

ITEM No.	USE	TYPE	NOTES
V2	Output	50C5	
V3	Output	50C5	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	SYLVANIA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■40	150	161-3034	AFH3-10	C0090	FP311.5	TMT-9	T-045	TVL-3440
B	▲40	150							
C	40	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	SYLVANIA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C3	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C4	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C5	20000			BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C6	.047	400		P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	SYLVANIA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	2.2meg	½	153-0142					
R2	500K	½	153-0141	B-58 †				Loudness, Tap ⓐ 500K & 1meg
R3	1meg	½	153-0140	B-70 †				Treble Bass

† Use AK-26 adaptor bushing, enlarge mounting hole in cabinet and use mounting nut furnished.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

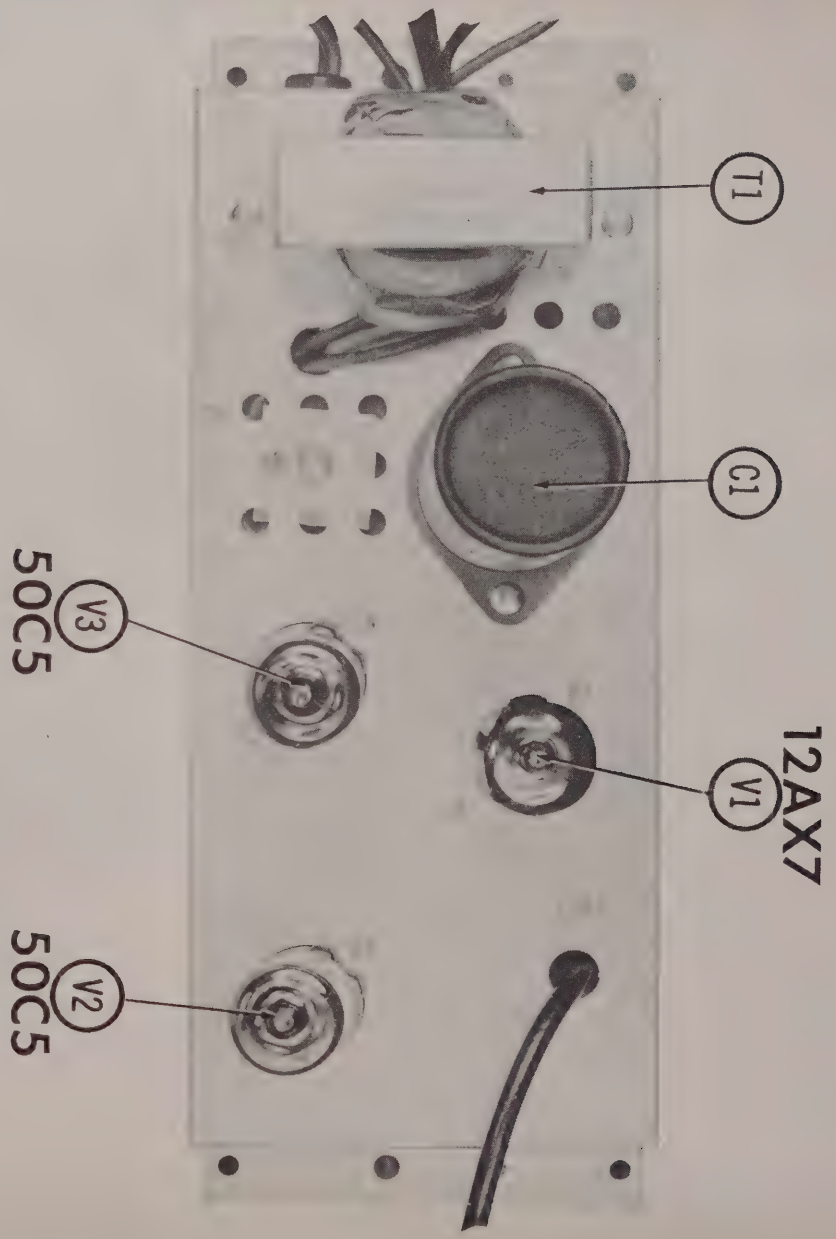
ITEM No.	RATING		SYLVANIA PART No.	NOTES
	OHMS	WATT		
R4	4.7meg			
R5	220K			
R6	3900Ω			
R7	12K			
R8	220K			
R9	10K			

ITEM No.	RATING		SYLVANIA PART No.	NOTES
	OHMS	WATT		
R10	470K			
R11	82Ω	1		
R12	470K			
R13	1000Ω	1		
R14	33Ω	1		
R15	27Ω		189-0086	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	SYLVANIA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2900Ω CT	1-2Ω	143-0069	Z1010	A-2901	AU-600	A-3823	24S61	S-55Z	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	SYLVANIA PART No.	QUAM PART No.	
SP1	6"	PM	3-4Ω	539-0606 ①	6A15 ①	① Parallel And Phase
SP2	6"	PM	3-4Ω	539-0606 ①	6A15 ①	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	SYLVANIA PART No.	REPLACEMENT DATA
K1	Tone Compensation	18mmf, 27mmf, 820mmf, 3000mmf, 4700mmf 47K, 68K, 330K	190-0038	

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	SYLVANIA PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.099A	517-0017	1235AH	T150 SD-94 ①	150 K200 ①	① Silicon Type

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	SYLVANIA PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M2		53-T	GD-J			

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	SYLVANIA PART No.	JENSEN PART No.	WALCO PART No.	
M3		† S-66 or †♦ S-66SD or ♦ S-66D	† W-75TPS or †♦ W-75DS or ♦ W-75TPD	† Jewel ♦ Diamond

CABINETS & CABINET PARTS

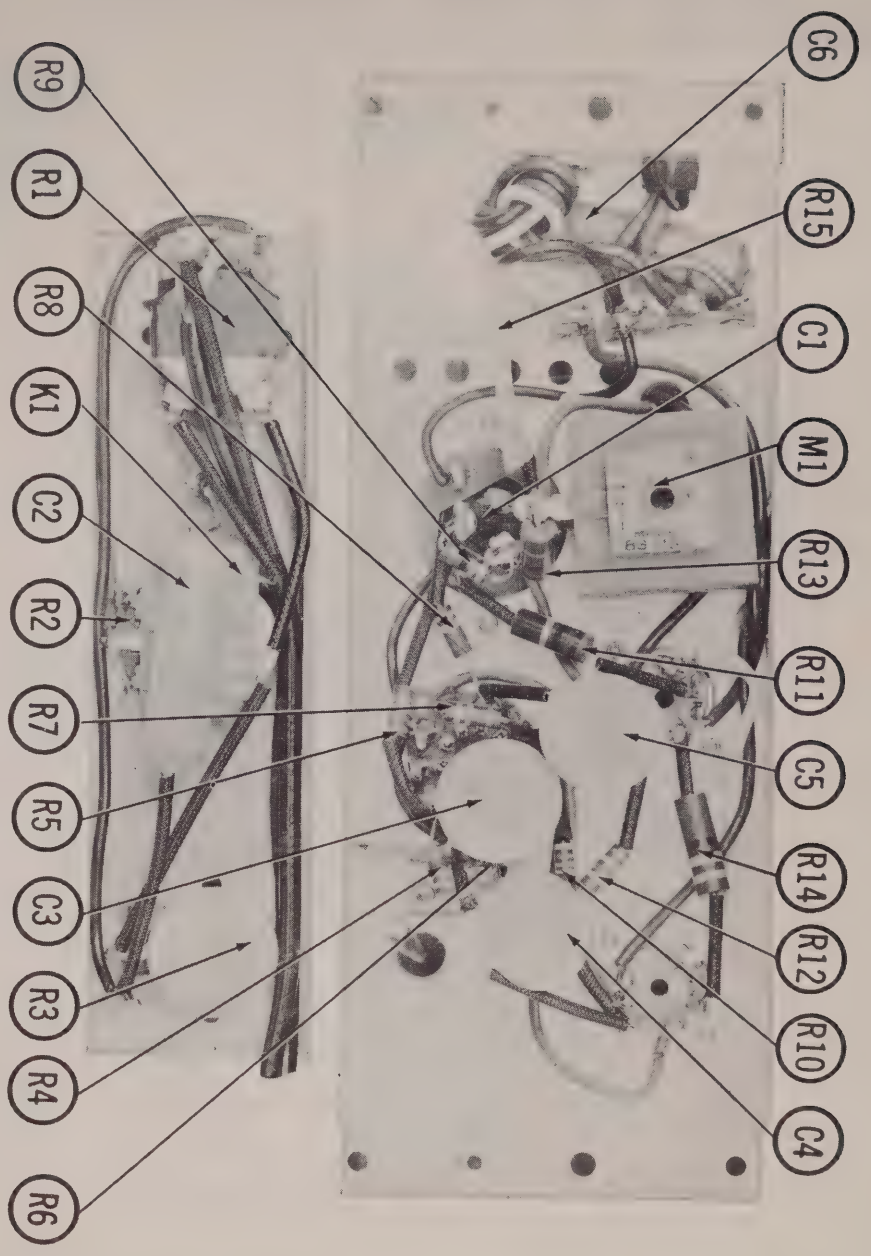
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

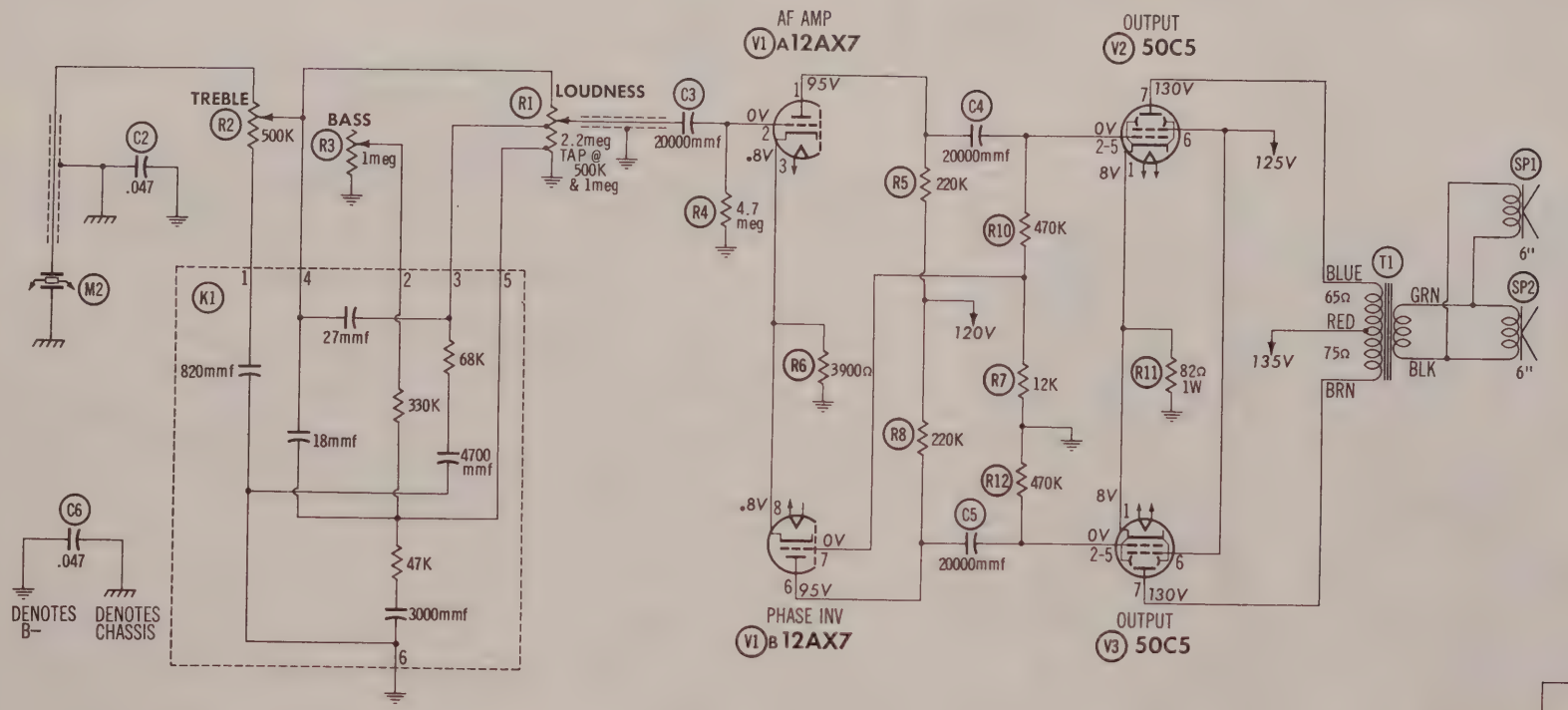
NAME	PART NO.	DESCRIPTION
Knob	740-0190	Treble, Bass, Loudness

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

CHASSIS—BOTTOM VIEW

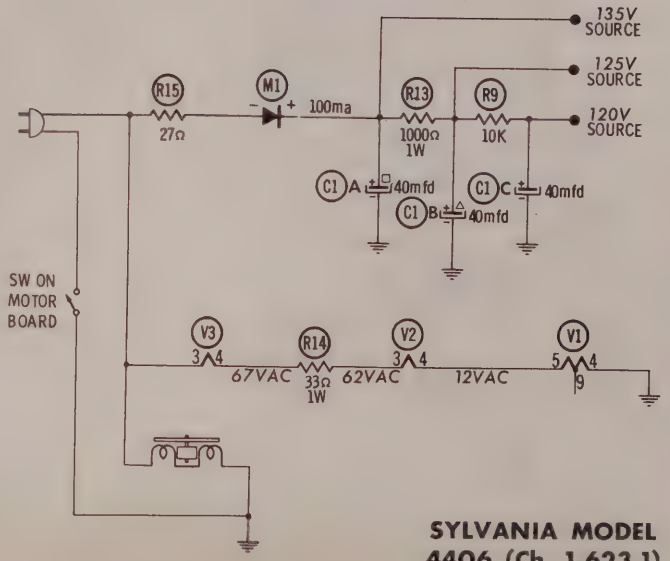




RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	† 230K	4.7meg	3900Ω	0Ω	12Ω	† 230K	12K	3900Ω	6Ω
V2	50C5	82Ω	480K	62Ω	12Ω	480K	† 1000Ω	† 65Ω		
V3	50C5	82Ω	470K	145Ω	95Ω	470K	† 1000Ω	† 75Ω		

† MEASURED FROM OUTPUT OF M1.



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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SYLVANIA MODEL 4406 (Ch. 1-623-1)

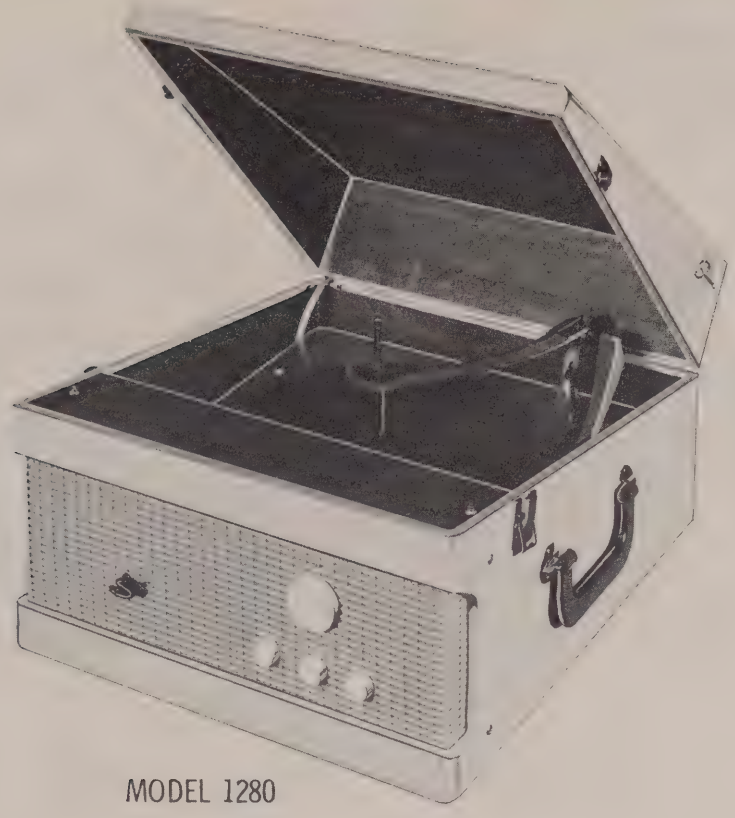
PHOTOFACT* Folder

*TRADE MARK

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

SYMPHONIC MODELS 1258, 1280

SYMPHONIC MODELS
1258, 1280



MODEL 1280

SYMPHONIC MODELS
1258, 1280

TRADE NAME	Symphonic Models 1258, 1280
MANUFACTURER	Symphonic Radio & Electronics Corp., 235 Jersey Ave., New Brunswick, N. J.
TYPE SET	AC Operated AM Receiver With 4 Speed Automatic Record Changer
TUBES	Five
POWER SUPPLY	110 - 120 Volts AC, 60 Cycles
RATING	27 Watts, .28 Amp@117 Volts AC (Less Motor)
TUNING RANGE—BROADCAST	535 - 1650KC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE SIMILAR V-M 1200A - PHOTOFACT SET 353 FOLDER 16, OR RECORD CHANGER MANUAL RC-10.

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:

A1, A2, A3, A4..... General Cement #8606, 8606L
Walsco #2543, 2544, 2545

A5, A6..... General Cement #5004, 5008
Walsco #2520

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01mfd	High side to pin 7 (grid) of 12BE6 (V1). Low side to B-.	455KC (400~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output on second peak in a clockwise direction.
2.	"	"	1600KC	1600KC	"	A5	Adjust for maximum output
3.		Loop	1400KC	Tune for 1400KC signal	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

H817

SET 432 FOLDER 15

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	12BE6	
V2	IF Amplifier	12BA6	
V3	Det.-AVC-AF Amp.	12AV6	

ITEM No.	USE	TYPE	NOTES
V4	Output	50C5	
V5	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA SYMPHONIC PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	60	150	CE-101 ①	PR3-030	BBRQ42215C				TVLS-3442. 9*
B	40	150							
	20	150							

① Model 1258 uses a 40-30-20@150 , Part No. CE-100.
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA SYMPHONIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.047	400	CP-200	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C3	100		CC-102	BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C4	.047	400	CP-200	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C5	2000		CC-106	BPD-002	DD-202	BYA10D2	DC522	5HK-D2	
C6	10000		CC-100	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C7	.047	400	CP-200	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C8	.047	400	CP-200	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA SYMPHONIC PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES	
R1A	500K	½	VC-139	B-60	A47-500K-Z	Q13-133	U48	Volume	Note 1
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.		
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26		
R2A	200K	½	VC-118	B-46	A47-200K-S	Q11-129	U43	Tone	Note 2
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.		

Note 1. Part #VC-112 used in Model 1258
Note 2. Part #VC-110 used in Model 1258
* Use KR with CRL "Red Label" controls and KB with "Blue Label" controls.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	SYMPHONIC PART No.	NOTES
R3	22K		224	Note 1
R4	47K		215	
R5	150Ω		214	
R6	2. 2meg		212	

Note 1. Some versions may use 10K in this application.

ITEM No.	RATING OHMS	RATING WATT	SYMPHONIC PART No.	NOTES
R7	33K		207	Note 2
R8	150Ω		214	
R9	150Ω	1	404	
R10	1000Ω		114	

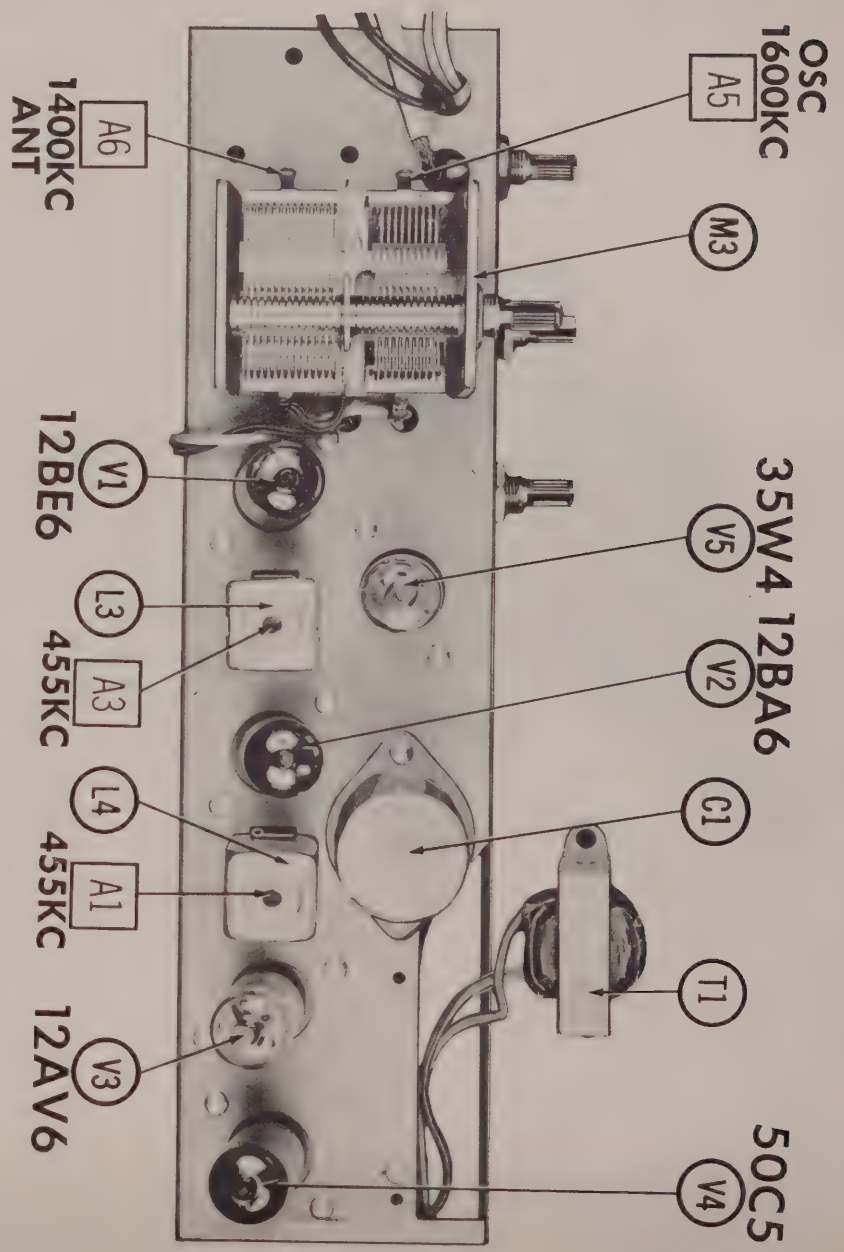
Note 2. Not used in some versions.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA SYMPHONIC PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loopstick	AL-101 ①					
L2	Osc. Coil	LO-104 ②	14-1074				
L3	Input IF	LF-100	16-6758	BC-352	12-C1	RF-1	
L4	Output IF	LF-101	16-6758	BC-353	12-C2	RF-2	

① Part #AL-100 used in Model 1258. ② Part #LO-101 used in Model 1258.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	SYMPHONIC PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2350Ω	3-4Ω	TR-109 ①	Z1101	A-3025	AU-605	A-3332	24S53	S-12X	① Used in Model 1280 only

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	SYMPHONIC PART No.	QUAM PART No.	
SP1	4" 5 1/4" 4"	PM PM PM	3-4Ω	SP-407 ① SP-605 ② SP-401 ②	4A07	① Used in Model 1280. Alternate Part #SP-406. ② Used in Model 1258

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	SYMPHONIC PART No.	REPLACEMENT DATA	
K1	Audio Coupling Circuit	2000mmf, 220mmf, 250mmf, 5000mmf, 6.8meg, 470K, 470K	PC-150	Aerovox Centralab Cornell-Dubilier Sprague	PA-113-1 PC-150 116TM1 DT-4

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	SYMPHONIC PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1		118-TS	N8-1 and N8-3			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	SYMPHONIC PART No.	JENSEN PART No.	WALCO PART No.	
M2	(78)	† CRA-55 or ♦ CRA-55D	† W-64S or ♦ W-64D	† Jewel ♦ Diamond
	(LP)	† CRA-55LP or ♦ CRA-55LPD	† W-64MGS or ♦ W-64MGD	

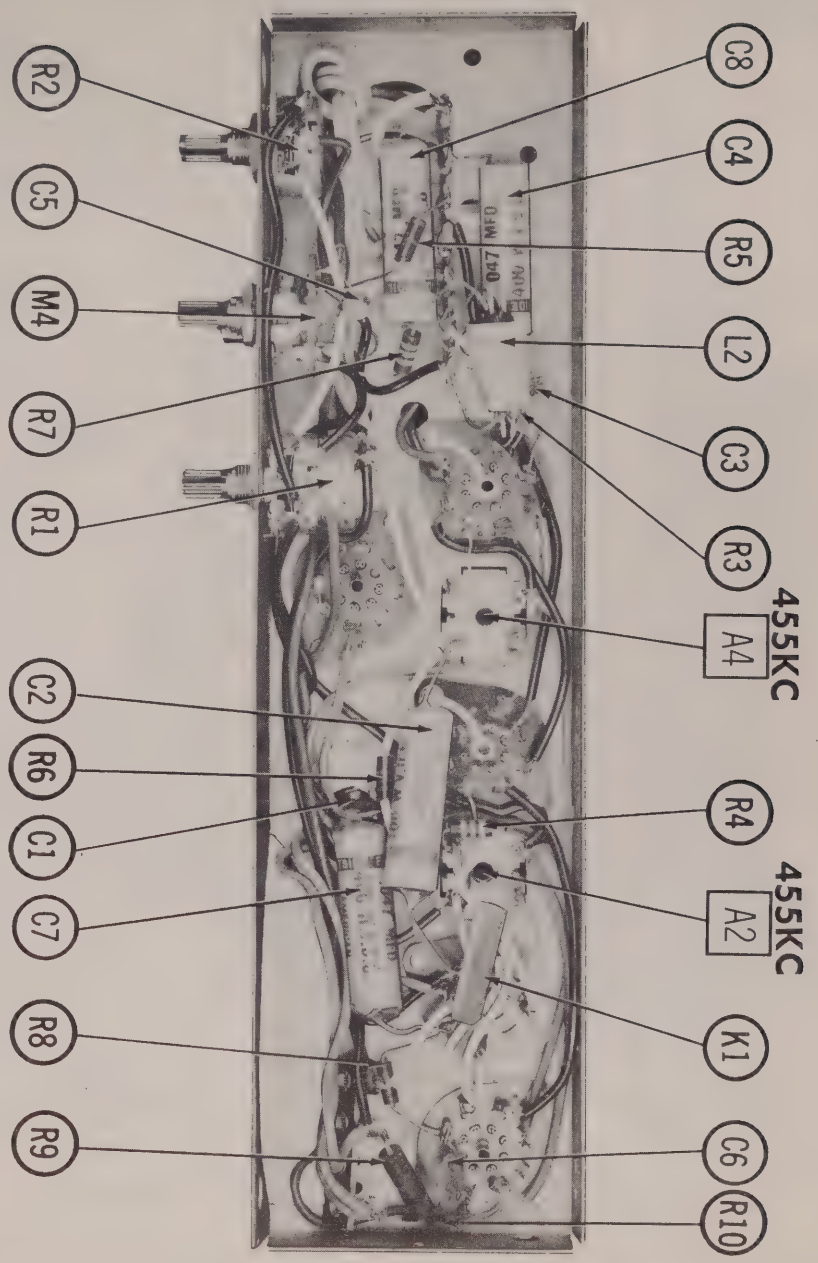
MISCELLANEOUS

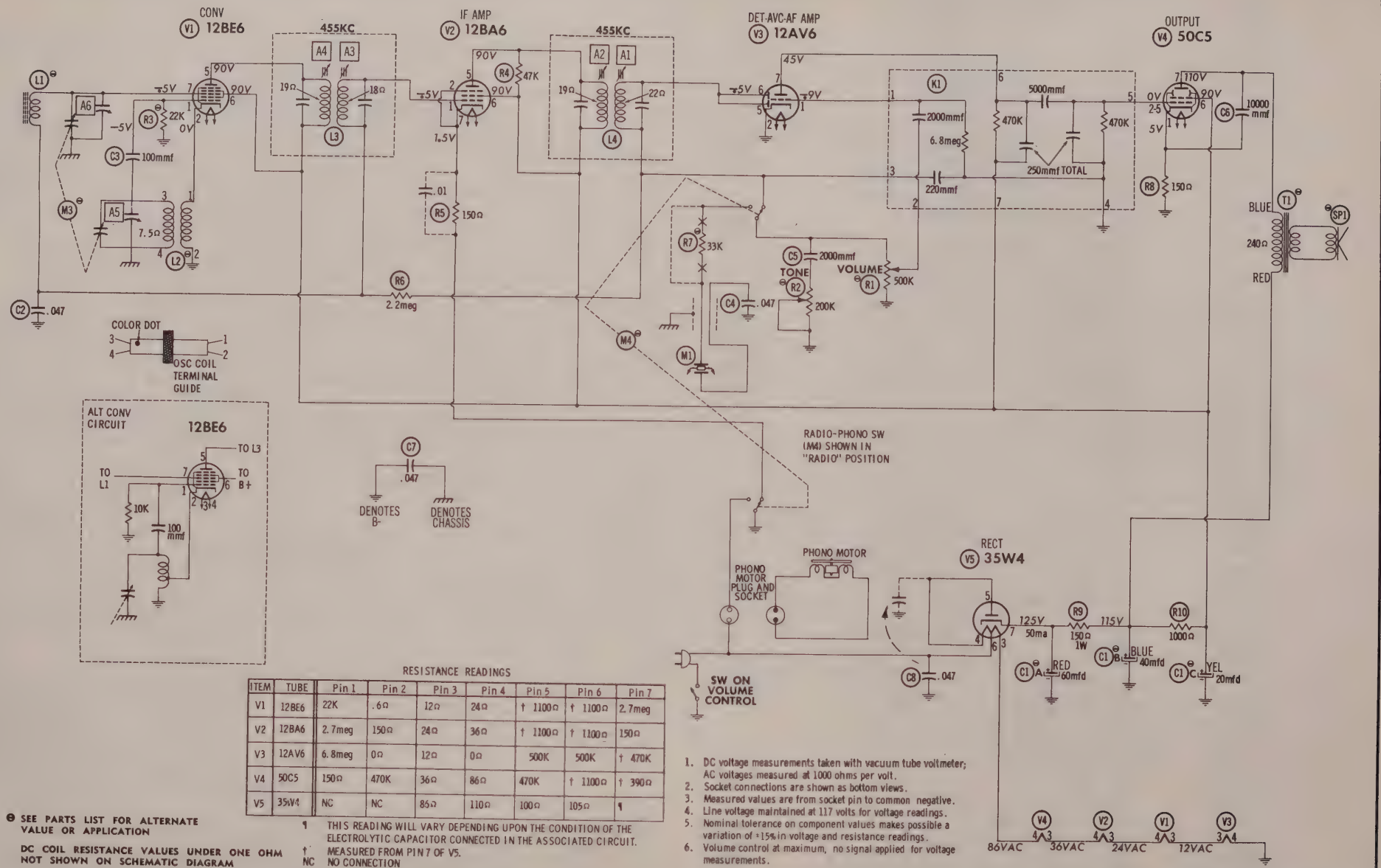
ITEM No.	PART NAME	SYMPHONIC PART No.	NOTES
M3	Tuning Cap.	CV-101	2 gang, Ant. 21-484mmf, Osc. 8-160mmf., Model 1280
	Tuning Cap.	CV-100	2 gang, Model 1258
M4	Switch	SW-109	Radio-Phono, Rotary, Wafer Type, Model 1280
	Switch	SW-100	Radio-Phono, Rotary, Wafer Type, Model 1258

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

CHASSIS—BOTTOM VIEW





RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BE6	22K	.6Ω	12Ω	24Ω	† 1100Ω	† 1100Ω	2.7meg
V2	12BA6	2.7meg	150Ω	24Ω	36Ω	† 1100Ω	† 1100Ω	150Ω
V3	12AV6	6.8meg	0Ω	12Ω	0Ω	500K	500K	† 470K
V4	50C5	150Ω	470K	36Ω	86Ω	470K	† 1100Ω	† 390Ω
V5	35W4	NC	NC	86Ω	110Ω	100Ω	105Ω	¶

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 7 OF V5.
NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

Ⓔ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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SYMPHONIC MODELS 1258, 1280

PHOTOFACT* Folder

EIA

TRAV-LER MODELS T-200, T-201, T-202, T-203, T-204

TRAV-LER MODELS T-200, T-201, T-202, T-203, T-204

MODEL T-200

TRADE NAME	Trav-Ler Model T-200, T-201, T-202, T-203, T-204
MANUFACTURER	Trav-Ler Radio & Tel. Corp., 571 W. Jackson Blvd., Chicago, Illinois
TYPE SET	AC-DC Operated AM Receiver
TUBES (Five)	Types 12BE6 Converter, 12BA6 IF Amplifier, 12AV6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-DC — RATING .27 Amp. @ 117 Volts AC (26 Watts)
TUNING RANGE—BROADCAST	540-1620KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to pin 7 (grid) of 12BE6 (V1) Low side to B-.	455KC (400∿ Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001mfd to reduce hum modulation.
2.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	600KC	600KC	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output while rocking tuning gang. Repeat steps 2 and 3.
4.		"	1400KC	Tune to 1400KC signal	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	12BE6	
V2	IF Amplifier	12BA6	
V3	Det. -AVC-AF Amp.	12AV6	
V4	Output	50C5	
V5	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	TRAV-LER PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	70	150		PRS150V8040	BBRD8415	TCD498	TDLD-11	MTD-303	TVA-2462
B	40	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	TRAV-LER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	220			SI 220	D6-221	LT6T22	UC-5322	5GA-T22	①
C3	68			1469-000068	DD-680	22R5T68		MS-468	10% ①
C4	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C5	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C6	.022	400							10%
C7	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C8	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	

① Not used in some versions.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	TRAV-LER PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	½	VC-100	B-60	A47-500K-Z	Q13-133	U48	Volume
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	

* Use KR with CRL "red label" controls and KB with "blue label" controls.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

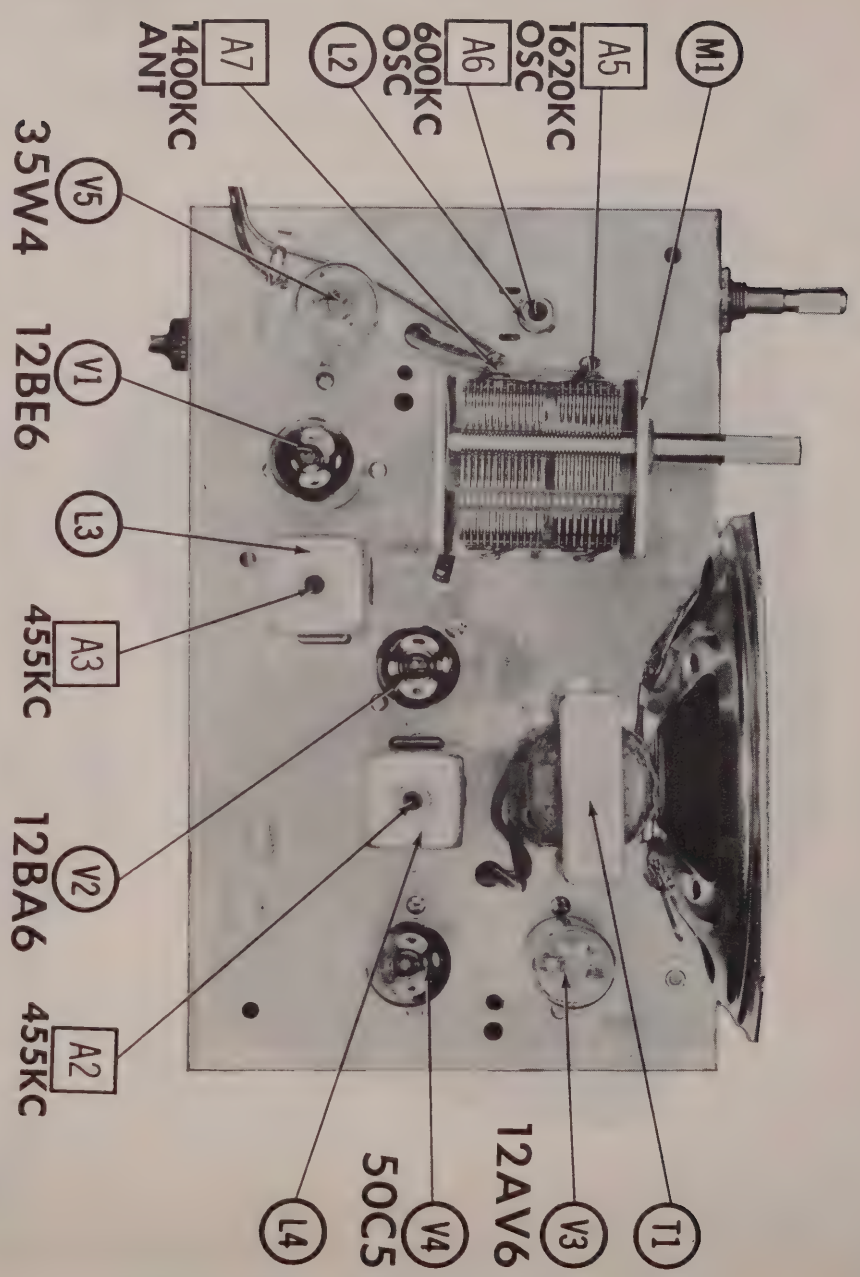
ITEM No.	RATING		TRAV-LER PART No.	NOTES
	OHMS	WATT		
R2	1.2meg			Note 1
R3	22K			
R4	47Ω			Note 1
R5	220K			
R6	220Ω			Note 2

Note 1. Not used in some versions.
Note 2. Some versions may use 120Ω in this application.

ITEM No.	RATING		TRAV-LER PART No.	NOTES
	OHMS	WATT		
R7	3.3meg			
R8	150Ω			
R9	1800Ω	1		Note 3
R10	220K			Note 1

Note 3. Some versions may use 1500Ω 1W in this application.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					
		TRAV-LER PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loop Ant.						Includes cabinet back
L2	Osc. Coil		14-1077	BC-393 *	69-OSC *		
L3	Input IF	LI-19	16-6758	BC-352	12-C1	RF-1	
L4	Output IF	LI-19	16-6758	BC-353	12-C1	RF-2	

* Disregard capacity winding.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	TRAV-LER PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2200Ω	3-4Ω	3823-7	Z1101 ①	A-3025 ①	AU-605 ①	A-3332 ①	24S53 ①	S-12X ①	① Use original channel frame.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	TRAV-LER PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	SPK-53	4A07	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	TRAV-LER PART No.	REPLACEMENT DATA	
K1	Audio Couplate	220mmf, 250mmf, 250mmf, 2000mmf, 5000mmf, 470K, 470K, 6.8meg		Aerovox Centralab Cornell-Dubilier Sprague	PA-113-1 PC-150 116TM1 DT-1

MISCELLANEOUS

ITEM No.	PART NAME	TRAV-LER PART No.	NOTES
M1	Tuning Cap.		2 Gang (Ant. 15-346mmf, Osc. 14-120 mmf)

CABINETS & CABINET PARTS

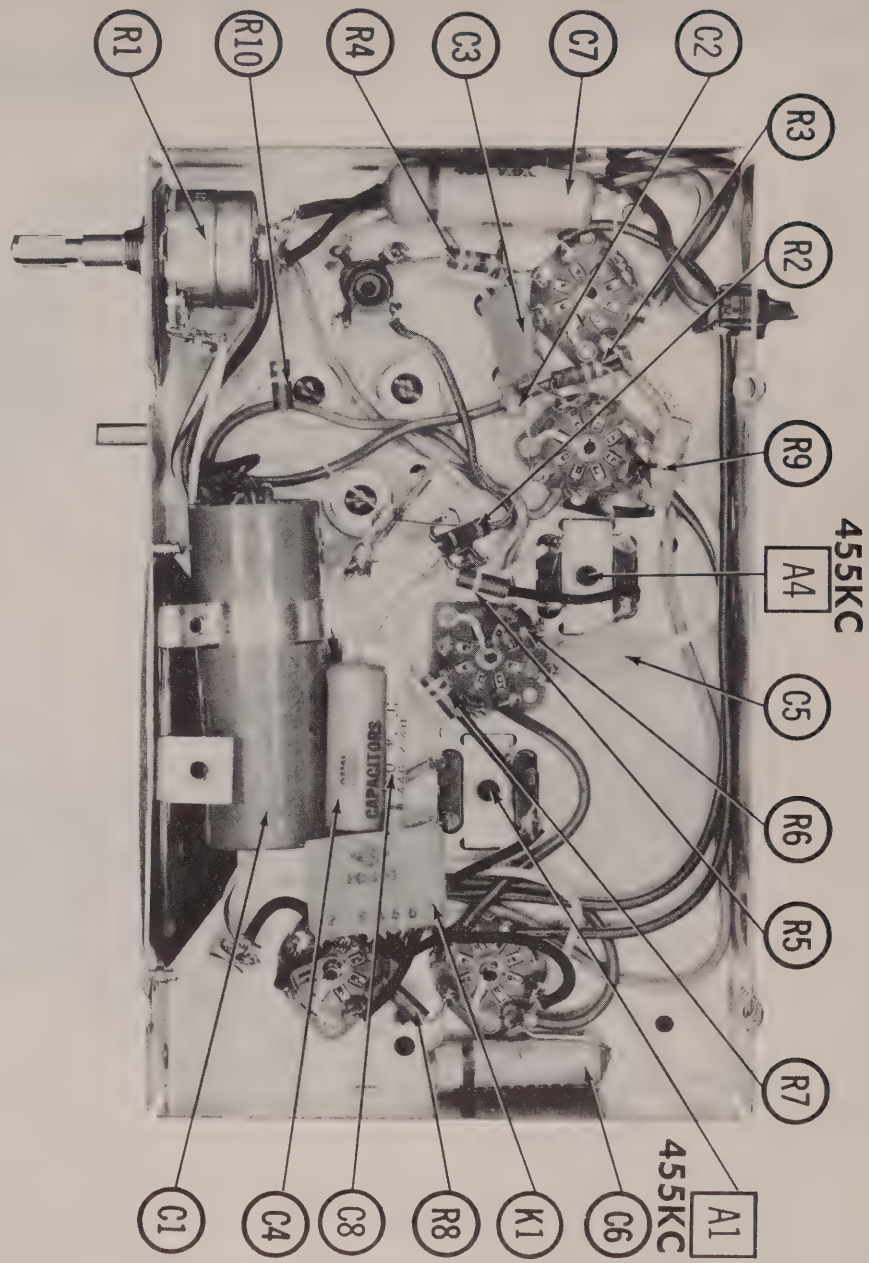
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

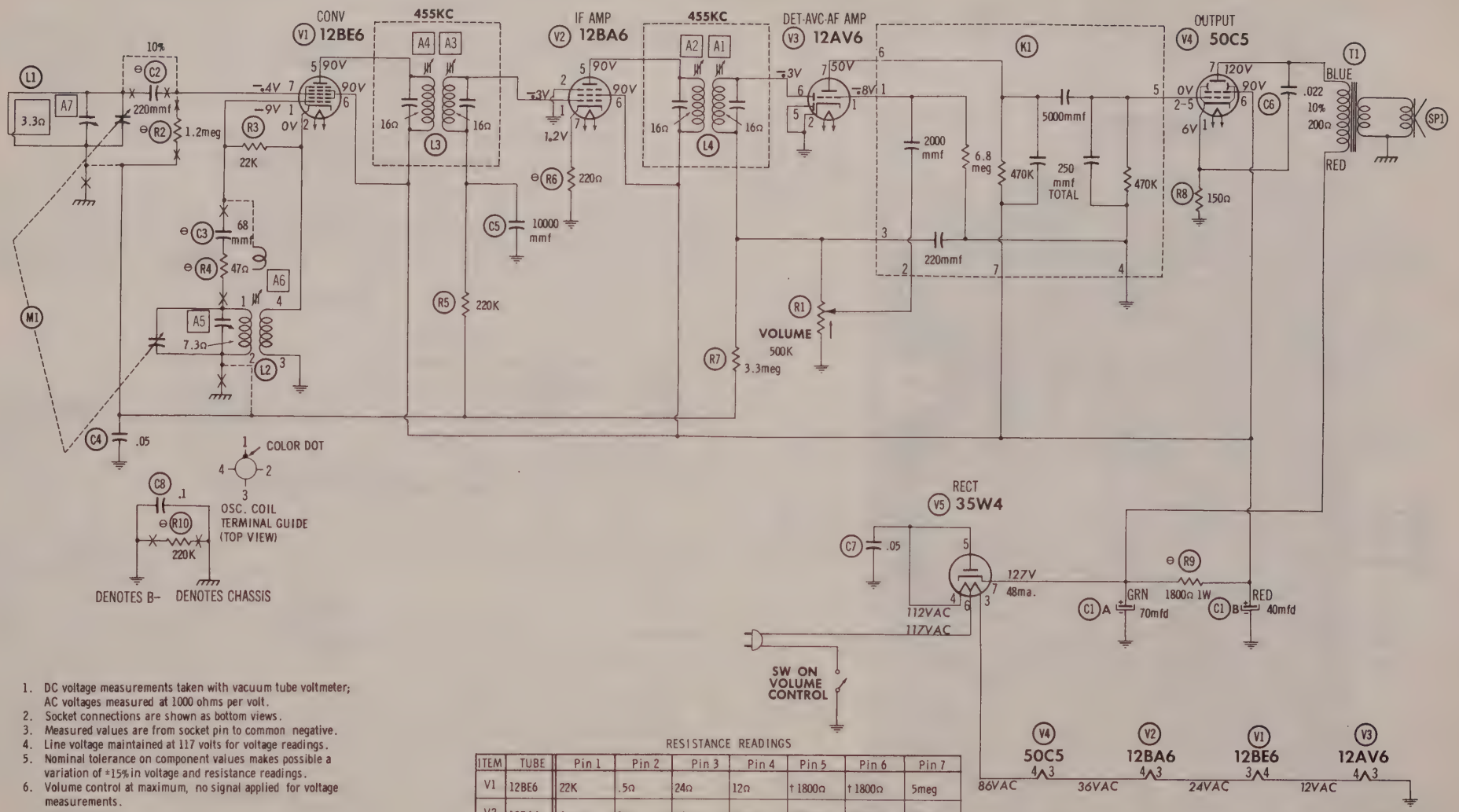
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

CHASSIS—BOTTOM VIEW



TRAV-LER MODELS T-200, T-201, T-202, T-203, T-204

FOLDER 16



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BE6	22K	.5Ω	24Ω	12Ω	† 1800Ω	† 1800Ω	5meg
V2	12BA6	4meg	0Ω	24Ω	36Ω	† 1800Ω	† 1800Ω	220Ω
V3	12AV6	6.8meg	0Ω	0Ω	12Ω	0Ω	500K	† 470K
V4	50C5	150Ω	470K	36Ω	86Ω	470K	† 1800Ω	† 200Ω
V5	35W4	TP	TP	86Ω	110Ω	110Ω	100Ω	¶

THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 7 OF V5.
TP TIE POINT.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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TRAV-LER MODELS T-200, T-201, T-202, T-203, T-204

PHOTOFACT* Folder with CIRCUITRACE*

EIA ELECTRONIC INDUSTRIES ASSOCIATION MEMBER

WESTINGHOUSE MODELS HF110AN, HF111AN (Ch. V-2503-2)

WESTINGHOUSE MODELS
HF110AN, HF111AN (Ch. V-2503-2)

MODEL HF110AN

WESTINGHOUSE MODELS
HF110AN, HF111AN (Ch. V-2503-2)

TRADE NAME	Westinghouse Models HF110AN, HF111AN (Ch. V-2503-2)
MANUFACTURER	Westinghouse Electric Corp., TV-Radio Div., Metuchen, N. J.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES	Three
POWER SUPPLY	105 - 120 Volts AC, 60 Cycles RATING 32 Watts, .35 Amp. @117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE COLLARS CONQUEST - PHOTOFACT SET 390 FOLDER 5

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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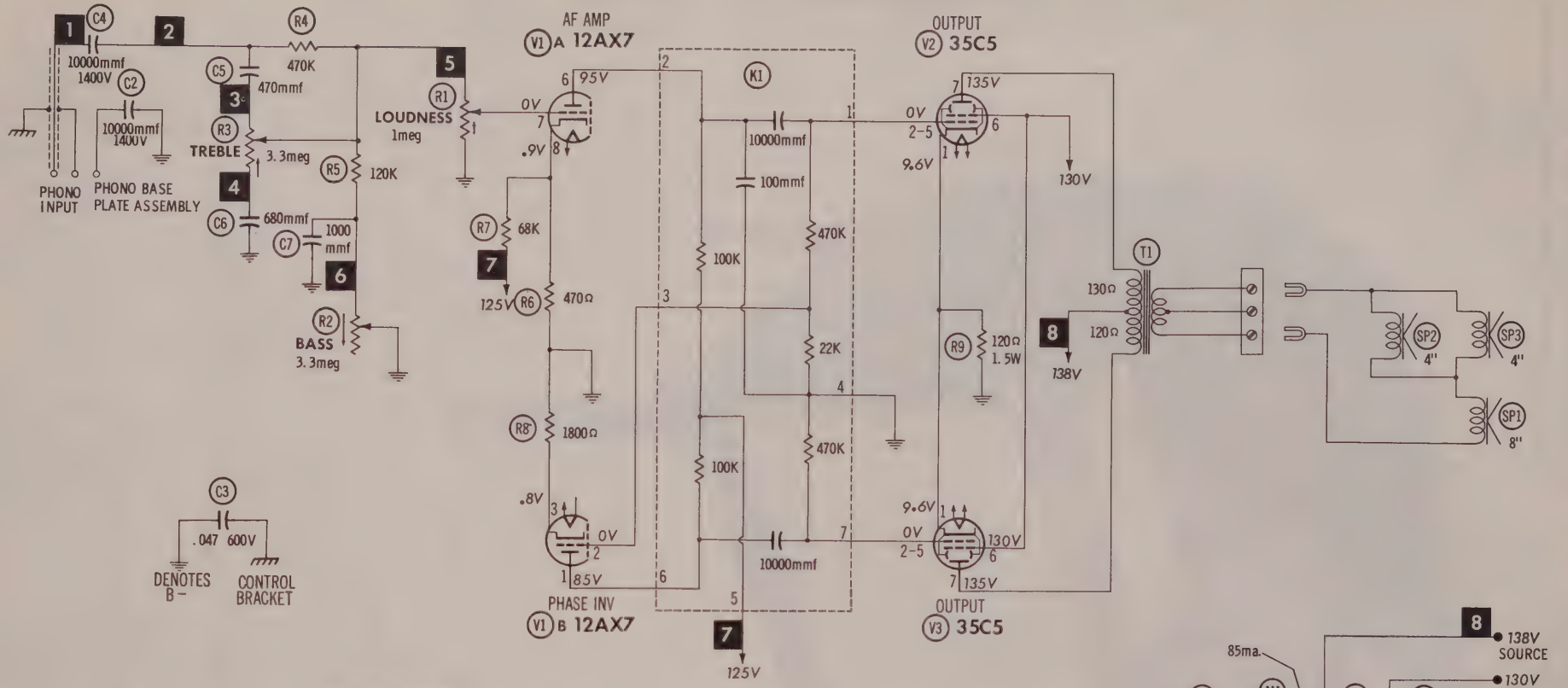
H870

SET 432 FOLDER 17



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†100K	22K	1800Ω	0Ω	12Ω	† 100K	0Ω	470Ω	6Ω
V2	35C5	120Ω	490K	240Ω	275Ω	490K	† 270Ω	† 130Ω		
V3	35C5	120Ω	470K	310Ω	275Ω	470K	† 270Ω	† 120Ω		

† MEASURED FROM OUTPUT OF M1.

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

WESTINGHOUSE MODELS HF110AN, HF111AN (Ch. V-2503-2)

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. -Phase Inv.	12AX7	
V2	Output	35C5	
V3	Output	35C5	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA Westinghouse PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■80	150	218V025H17		BBRT84215		TDLT-7	FMT-339	R2713 *
B	▲60	150							
C	20	150							

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA Westinghouse PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	10000	1400	215V201A03	DAC-27	DD16-103	HVE16S1		BL-S10	
C3	.047	600	210V214A73	P688N-047	DF-503	CUB6S47	GEM-6147	6TM-S47	
C4	10000	1400	215V201A03	DAC-27	DD16-103	HVE16S1		BL-S10	
C5	470		215V104A71	BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C6	680		215V106A81	BPD-00068	DD-681	BYA10T68	UC-5368	5GA-T68	
C7	1000		215V101A02	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C8	.047	600	210V024A73	P688N-047	DF-503	CUB6S47	GEM-6147	6TM-S47	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Westinghouse PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1meg	½	270V027H08					Loudness
B	Switch							
R2	3.3meg	½	270V052H02					Bass
R3	3.3meg	½	270V027H07					Treble

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Westinghouse PART No.	NOTES
R4	470K		250V224A74	
R5	120K		250V221A24	
R6	470Ω		250V224A71	
R7	68K		250V226A83	
R8	1800Ω		250V221A82	
R9	120Ω	1.5	251V023H19	
R10	230Ω	8	251V020H17	
R11	270Ω		250V222A71	
R12	2700Ω		250V222A72	
R13	22Ω	3	251V023H07	

PRINTED BOARD

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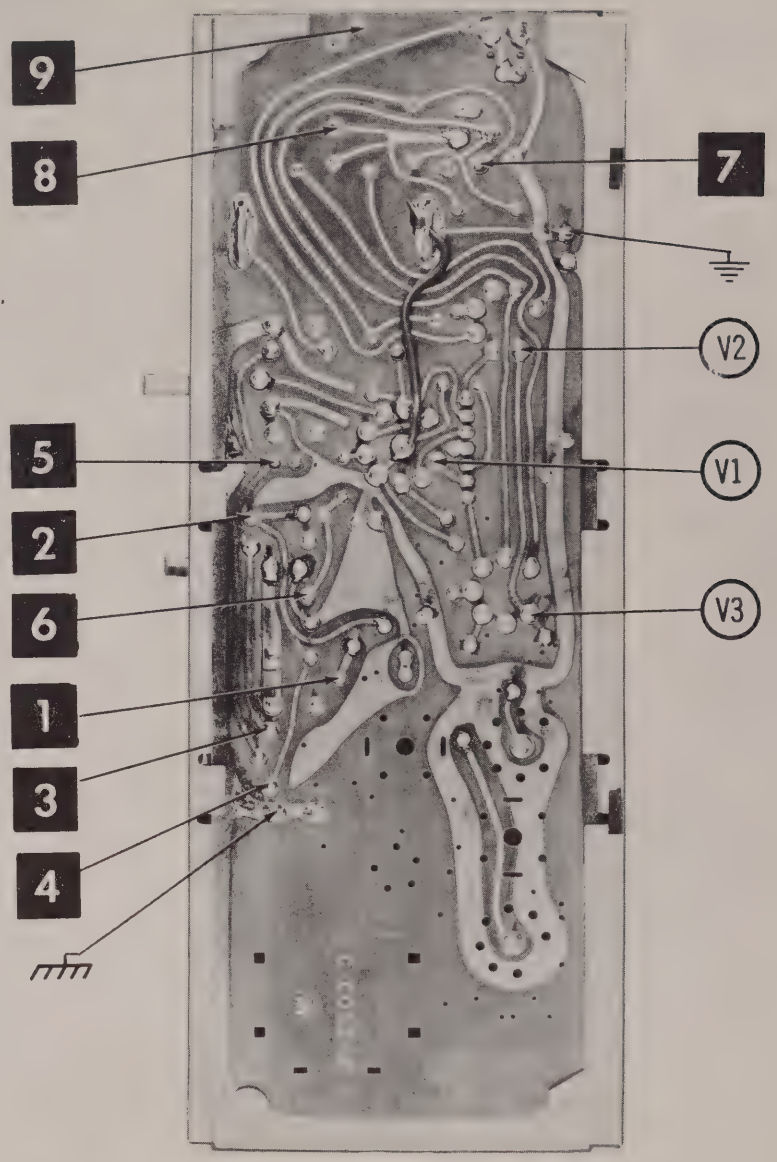
ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	4100Ω CT	16Ω Tap @ 8Ω	430V058H01	Z1022 ①	A-2901 ①	AU-606 ①	A-3823 ①	24S61 ①	S-53X ①	① Use original channel frame

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Westinghouse PART No.	QUAM PART No.	
SP1	8"	PM	14Ω	570V048H01	8A21Z14	①Parallel And Phase
SP2	4"	PM	3-4Ω	570V049H01 ①	4A07 ①	
SP3	4"	PM	3-4Ω	570V049H01 ①	4A07 ①	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	Westinghouse PART No.	REPLACEMENT DATA
K1	Audio Coupling Circuit	10000mmf, 100mmf, 10000mmf, 22K, 470K, 470K, 100K, 100K	219V024H02	

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	Westinghouse PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.085A	295V012H03	1235AH	T100 SD-94 ①	100AV K200 ①	① Silicon Type

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	Westinghouse PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M2		93-T				

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	550V084H01	On-Off-Volume, Bass, Treble
Cabinet	516V053H03	Mahogany, Model HF110AN
Cabinet	516V053H04	Oak, Model HF111AN
Legs	518V001H11	Model HF110AN
Legs	518V001H12	Model HF111AN

WIRING DATA

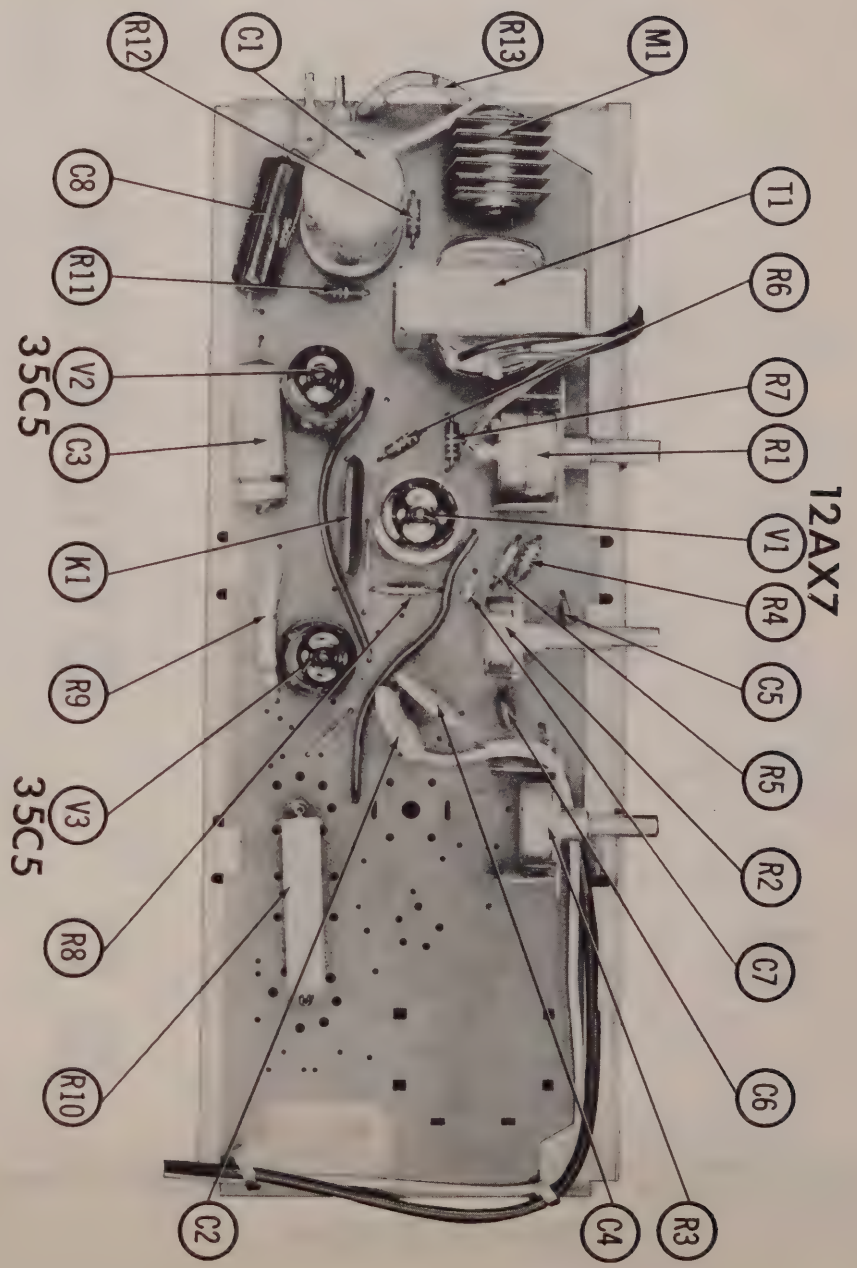
General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

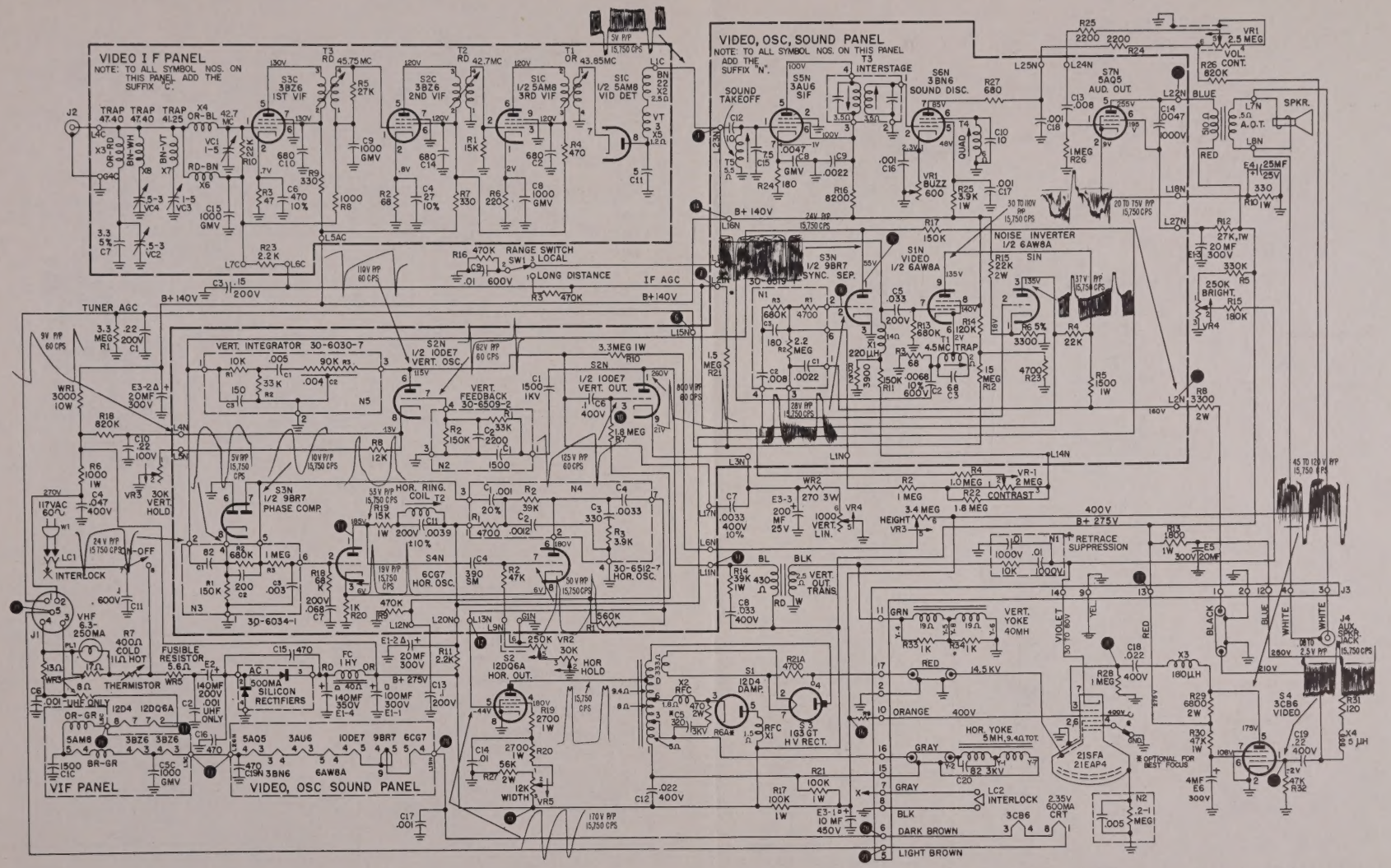
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

Low-Loss Shielded Lead (Interconnecting) .....Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)

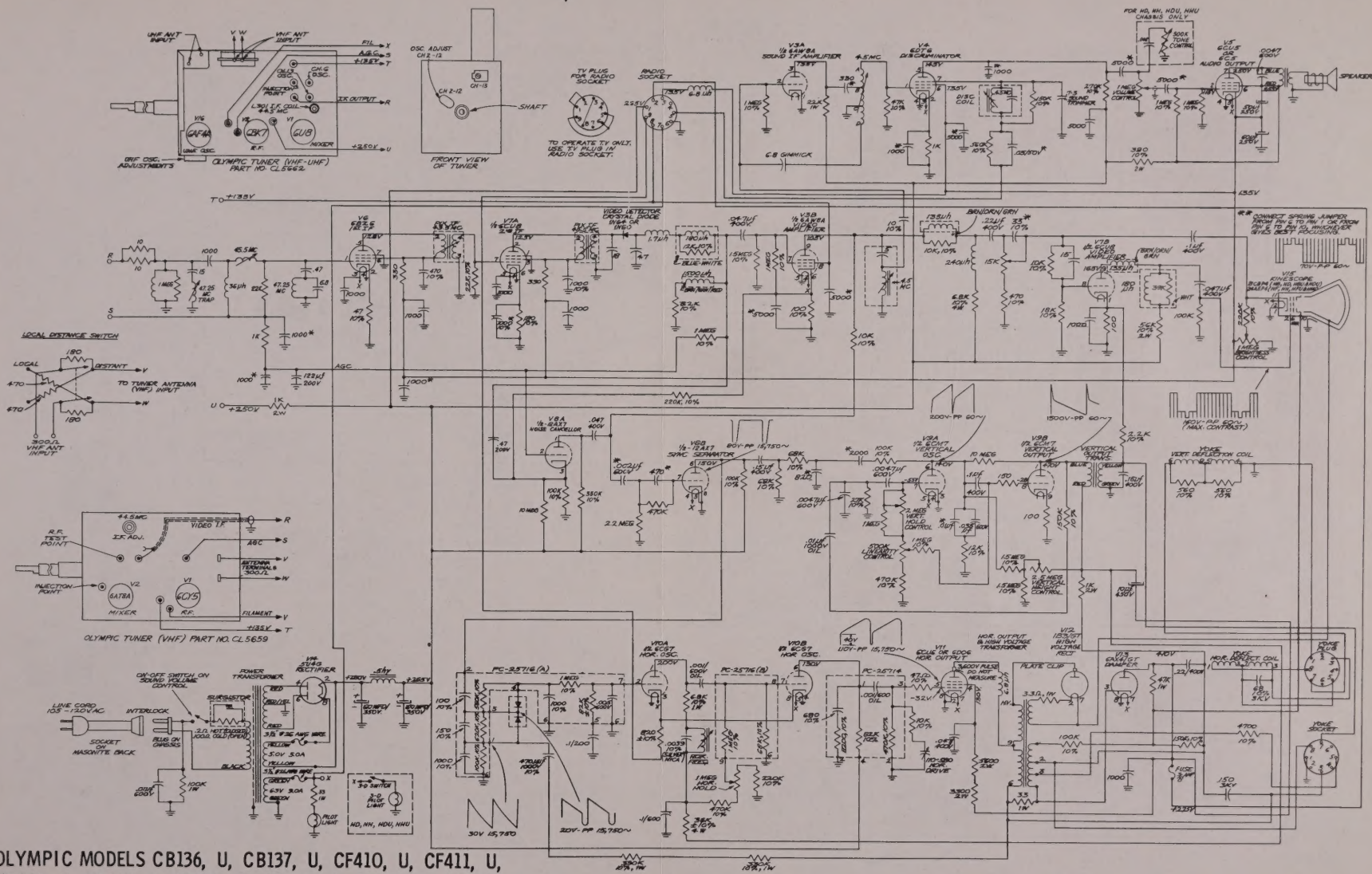
CHASSIS—TOP VIEW





PHILCO MODELS G4710, L, UG4710, L (Ch. 9L38, U)

Schematic Diagram Courtesy of PHILCO CORP.



OLYMPIC MODELS CB136, U, CB137, U, CF410, U, CF411, U, KB146, U, KD148, U, KD149, U, KH416, U, KH417, U, TB131, U, (Ch. HB, HBU, HD, HF, HFU, HH, HHU)

Schematic Diagram Courtesy of OLYMPIC RADIO and TELEVISION INC.

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